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VALUE ENGINEERING FINAL REPORT, PROJECT: REMEDIAL ACTIONS AT OPERABLE UNIT 1 - FERNALD, RECORD OF DECISION PLAN, JULY 20, 1995

07/20/95

VE STUDY TEAM DOE-FEMP
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REPORT

Value Engineering

FINAL REPORT

PROJECT:

REMEDIAL ACTIONS AT OPERABLE UNIT 1 - FERNALD

RECORD OF DECISION PLAN

DATE: July 20, 1995

UNITED STATES
DEPARTMENT OF ENERGY
Fernald Field Office

UNITED STATES
DEPARTMENT OF THE INTERIOR
Bureau of Reclamation
Reclamation Service Center

WATER RESOURCES MANAGEMENT.....FOR THE FUTURE

REMEDIAL ACTIONS AT OPERABLE UNIT 1
RECORD OF DECISION PLAN

PRESENTATION OF THE VALUE STUDY PROPOSALS ATTENDANCE LIST
12:10 p.m., JUNE 30, 1995
FERNALD CONFERENCE ROOM

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VALUE ENGINEERING STUDY

REMEDIAL ACTIONS AT OPERABLE UNIT 1

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TEAMLIST.MEM

GENERAL DISCUSSION OF VALUE ENGINEERING, ITS PURPOSE, AND THIS STUDY

Value Engineering (VE) is a problem-solving methodology originally developed by Larry Miles in 1943. In general, features from a project or process are examined to determine pertinent functions, governing criteria, and associated costs. Then, through creativity techniques; resulting idea analysis; and development of the ideas identified during analysis to have the greatest value enhancement potential; alternative methods that fully meet necessary requirements at a lower cost, or with an increase in the long-term value, are proposed for adoption by the parties responsible for the feature studied.

This report is the result of a "formal" VE study. A formal VE study team is comprised of people with the desired expertise who are not notably involved in the project or process activity. The VE study team takes a "fresh look" at the concept to see if this examination, using VE methodology applied to the current collected data, can create alternatives and plan a direction which can fulfill the client needs at greater value (worth).

Value Engineering (also known as Value Management, Value Analysis, and Value Planning) has been extremely successful for both private and Governmental entities. As a result, Federal Government has mandated its use, through its regulatory powers, in all Governmental operations. This VE report has the substance required to demonstrate that quality VE methodology was used throughout this study, as stipulated under the mandated Governmental VE program (as recommended by the Department of Interior and Bureau of Reclamation guidance) and respected recommendations of the VE profession.

VEDISCUS.APP

VE STUDY TEAM ACKNOWLEDGMENT OF FERMCO STAFF, PARSONS STAFF, AND CONSULTANTS

The VE Study Team wishes to express thanks and appreciation to Parsons' and FERMCO's staff who fully and cordially provided all requested information and consultation on the present concept and proposals. The success of the VE effort would not be possible without the full cooperation shown by these staffs. The VE Study Team would also like to express their appreciation to all the FERMCO staff who supported the study team's efforts through their facility and staff assistance at their Cincinnati, Ohio, offices. Additionally, the study team wishes to thank all those who helped the team through their additional information and expertise assistance.

The aim of VE is to achieve a high-value product. It is only with the full team effort, as shown by all involved, that this goal can be achieved. This study represents the product of such an effort.

VATHANKS.CIT

EXECUTIVE SUMMARY OF PROPOSALS

General:

The Value Engineering Study Team (VEST) consisted of expertise from chemical specialists, construction, civil engineering, radiation technology, and waste management specializations. The team had their first group meeting on June 26, 1995. The VEST concluded the full formal team efforts on June 30, 1995, with a presentation to the design and remedial crew staff at the Fernald, Ohio, site.

The VEST made three formal recommendations (developed to the point that the recommendations were complete enough for formal presentation at the completion of the study as an "alternative recommendation"). The team also identified nine additional items that should be recommended for further study. These ideas have the potential for increasing the value of the project, but were not developed by the team into a formal recommendation due to time constraints or other factors.

Summary of Recommendations:

Formal recommendations are ideas which were examined by the VEST and determined to have significant potential to generate technical and/or economical advantages to the owners, users, and/or others affected by the project. These recommended alternatives are respectfully submitted for consideration for adoption by the involved project parties.

Due to time constraints and other factors, the full potential of the savings value was not fully evaluated within the time frame of the value study. However, the **total estimated initial expenditure savings** of the evaluation completed during the value study, if all independent monetary savings recommendations are accepted, are estimated to exceed **$1,600,000.** All proposals have value added features which are expected to improve the final product. (Value added features are defined as proposal features where the study team believes that the increase in project or life cycle costs involved are more than offset by the apparent added nonmonetary value, and/or have undetermined cost savings which will exceed the expected proposal cost.) Proposals No. 2 and 3 can be implemented independent of all other proposals. To be economic, Proposal No. 1 is dependent on the acceptance of an innovative dryer as recommended in Proposal No. 2.

A very brief description and the minimum potential value of the recommendations are:

1. **Improve material handling system** by installing a slurry processing system and dryer to handle waste that is difficult to handle by mechanical methods. This proposal is a **value added** proposal with the nominal identified initial costs savings, as estimated within the value study constraints. This proposal will allow potential future increased costs to be avoided, which could be incurred due to difficult material handling issues.

2. **Increase dryer flexibility** by using pulse or other innovative technology dryers designed to handle high-water content materials with difficult physical handling characteristics. This proposal is a value **added** proposal to avoid the potential for increased costs being incurred due to downtime, during the operation of the remedial actions. It will also provide a more rapid process rate with no increase in capital cost.

3. **Densify the material to be shipped** by using a vacuum extruder system to reduce the volume and cost of disposal at the off-site location. Probable initial project cost savings exceed **$1,600,000**.

Summary of Additional Items for Further Study.

Nine additional items for further study were recommended. These are items that, due to time constraints, the lack of apparent large significant savings or value added during initial idea evaluations, complexity of idea, or scope of the idea (as compared to the study scope), make further investigation by the VEST, within their limited time constraints, inadvisable. They are respectfully submitted for further consideration and development to add value for the project, but were not developed to the detail of the previous alternative recommendations by the value study team. Briefly, these ideas are:

- Treat fast, store, and ship at alternative timing.
- Obtain additional assistance in negotiating services for critical contract.
- Look for other sites for disposal.
- Establish contingency plan to off-site treatment.
- Integrate remedy actions with other operable units.
- Examine cost sharing to reduce overall Government costs.
- Use performance based contracts with private sector.
- Increase flexibility by revising outdated rules.
- Improve communication with field and operating staffs with practical expertise.

PROJECT DESCRIPTION

General
The Feed Materials Production Center (FMPC) in Fernald, Ohio, is a 1,050 acre facility about 18 miles northwest of Cincinnati, Ohio. It was the manufacturing site for producing uranium-metal products for the United States' Defense Programs for more than 37 years. On July 10, 1989, production operations were indefinitely suspended and in February 1991, the Department of Energy (DOE) formally submitted its plan to permanently end production at the site. Since 1989, the primary DOE mission, at the FMPC site, is to achieve the restoration of the facility grounds and create environmental compliance. Only about 55 acres were affected by the production process; the remaining portion of the site was leased out for livestock grazing.

In 1986, the DOE and Environmental Protection Agency (EPA) entered into a Federal Facilities Compliance Agreement (FFCA). In this FFCA the DOE agreed to comply with various Federal and State pollution control regulations, including those under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), and address the remediation of inactive waste sites, waste storage sites, and other on-site facilities. Portions of the FFCA were updated in 1990 and subsequent years. The FFCA defines five Operable Units (OU): OU1, the waste pit area; OU2, other waste units; OU3, production activity areas; OU4, silos 1-4; and OU5, environmental media.

The DOE overall plan is to achieve compliance with all applicable environmental requirements and clean up the inactive sites and facilities by the year 2010. The Fernald Field Office has been very aggressive in its environmental cleanup plan activities to achieve that goal. This operation and the overall environmental site effort is referred to as the Fernald Environmental Management Project (FEMP).

The site's drainage area lies within the north-south corridor of the 100- and 500-year Paddy's Run floodplain. The aquifer underlying the site is the Great Miami Aquifer (with about 500,000 of the local population using it) and is designated a sole source aquifer by the EPA under the provisions of the Safe Drinking Water Act.

Operable Unit 1
This unit consisted of the on-site facility that was used for storage of low-level radioactive waste. The Record of Decision (ROD) for remediation of the OU1 site was completed in January 1995.

The unit covers about 38 acres and consists of six waste pits, a clearwell, and a burn pit. Pits are specified as wet (received most wastes in a slurry form) and dry (received most wastes in a solid or dry form). Table 1 shows the general waste pit characteristics.

PROJECT DESCRIPTION

The OU1 units are:

Pit 1 - Constructed in 1952. Slurries were filtered or calcined to remove water before placement. Used for clearwell for liquids removed from Pit 2 in 1958-1959. Closed and covered with clean fill in 1959.

Pit 2 - Constructed in 1957 and used as settling basin for neutralized raffinate during 1958-1959. Closed and covered with clean fill in 1964.

Pit 3 - Constructed in 1958 and was first waste pit built specifically for settling solids from liquid waste streams. Large amounts of neutralized residues of uranium-bearing magnesium fluoride slag were pumped to site during late 1960's. Fill materials such as filter cake were added in 1973. Closed and covered with soil in 1977.

Pit 4 - Constructed in 1960. In addition to the solid wastes, at least 100 drums were deposited on the west side of this pit, along with a variety of noncombustible trash (cans, construction debris, and asbestos). Barium chloride floor sweeping deposited 1980-1983. Site closed in 1985 and interim closure done as Hazardous Waste Management Unit (HWMU) in 1986 with fill, clay, and polyethylene liner.

Pit 5 - Constructed in 1968 as a settling basin for slurries. Discharges were stopped in 1983 and use of pit was discontinued in 1987. Covered by water.

Pit 6 - Constructed September 1978 to June 1979. Received only depleted wastes, some extrusion residue, and heat treatment quench water. Use discontinued in 1985. Cover is by water.

Burn Pit - Source site for Pits 1 and 2 clay (therefore was formerly called the clay pit) and eventually had a gravel dumping pad built on the north end. Waste site use was to burn debris. Records of materials is incomplete; but is known to have consisted of laboratory chemicals, oils, low-level contaminated materials (pallets, skids, etc.) cafeteria debris, cans, bottles, and general refuse. Filled during the construction of Pit 5 with soil.

Clearwell - Constructed in 1959 during Pit 3 construction and acted as the final settling basin prior to periodic discharge of site surface water runoff to the Great Miami River.

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Table 1. Waste Unit 1 Characteristics

Unit	Operation Period	Cover Type	RCRA Status[1]	Liner Type[2]	Est. Waste Volume (CY)	Est. Total Volume (CY)	Approx. Depth (ft)	Surface Area (acres)	Dry /Wet	Major Waste Contents
Pit 1	1952-1959	Soil	SWMU	Clay	48,500	68,400	29.5	2.11	Dry	Magnesium fluoride slag, trailer cake, uranyl ammonium phosphate (UAP) filtrate, graphite/ ceramics, and general pump sludge
Pit 2	1957-1964	Soil	SWMU	Clay	24,200	37,400	23.5	0.90	Dry	Trailer cake, general pump sludge, UAP filtrate, raffinate, depleted residues, and graphite/ ceramics
Pit 3	1958-1977	Soil	SWMU	Clay	204,100	307,500	42.0	5.00	Wet	Lime-neutralized raffinate slurry, contaminated burn-pit storm runoff, general pump sludge, raffinate, trailer cake, slag leach, thorium, uranium-bearing magnesium fluoride slag, and acid leaching compounds
Pit 4	1960-1986	RCRA Cap	HWMU	Clay	55,100	72,800	32.0	1.50	Dry	Trailer cake, depleted slag and residues, thorium, graphite/ ceramics, non-combustible rubble, uranium-bearing magnesium fluoride slag, lime, and barium compounds

Table 1. Waste Unit 1 Characteristics

Unit	Operation Period	Cover Type	RCRA Status[1]	Liner Type[2]	Est. Waste Volume (CY)	Est. Total Volume (CY)	Approx. Depth (ft)	Surface Area (acres)	Dry /Wet	Major Waste Contents
Pit 5	1968-1983	Water	HWMU	EPDM	97,900	97,900	29.0	3.74	Wet	General pump sludge, raffinate, slag leach, thorium, lime, barium compounds, uranium, and trichloroethane (TCA)
Pit 6	1979-1985	Water	SWMU	EPDM	9,600	9,600	20.0	0.74	Dry	Depleted slag and residues
Burn Pit	1957-1968	Soil	SWMU	None	30,300	30,300	26.0	0.50	Dry	Burned combustible waste residues and general refuse
Clear -well	1959-1987	Water	SWMU	Clay	3,700	4,300	12.0	0.65	Wet	Construction debris, surface runoff from waste pits, and Pit 3 and 5 surface liquid (supernatant)

GENRDESC.SIT

[1]RCRA - Resource Conservation Recovery Act, SWMU - Solid Waste Management Unit, HWMU - Hazardous Waste Management Unit

[2]EPDM - Ethylene Propylene Diene Monomer elastomeric membrane (60-mil thick unless otherwise specified), clay liner consists of native clay

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Figure 1. Location Map

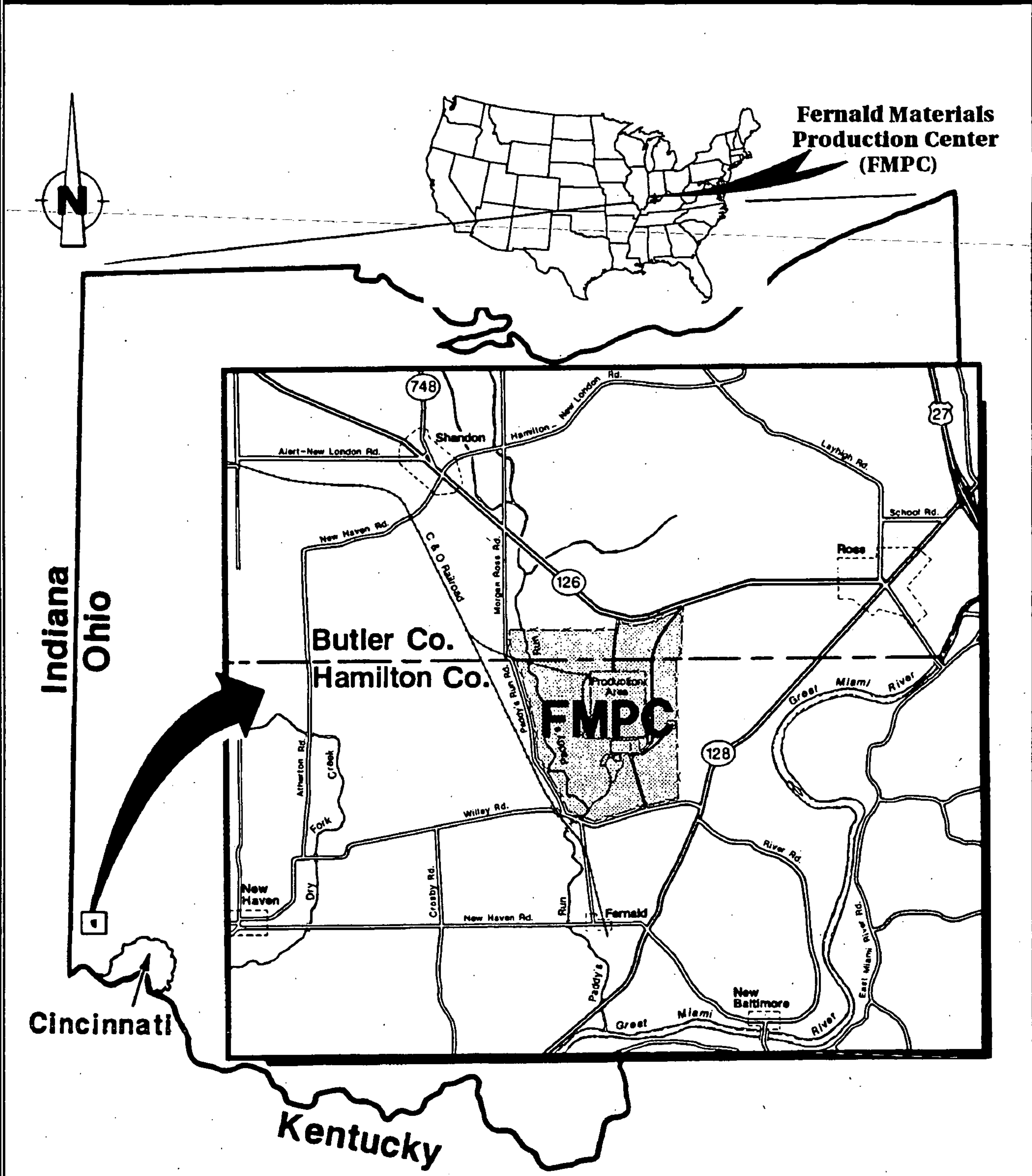

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Figure 2. FMPC Site Overview

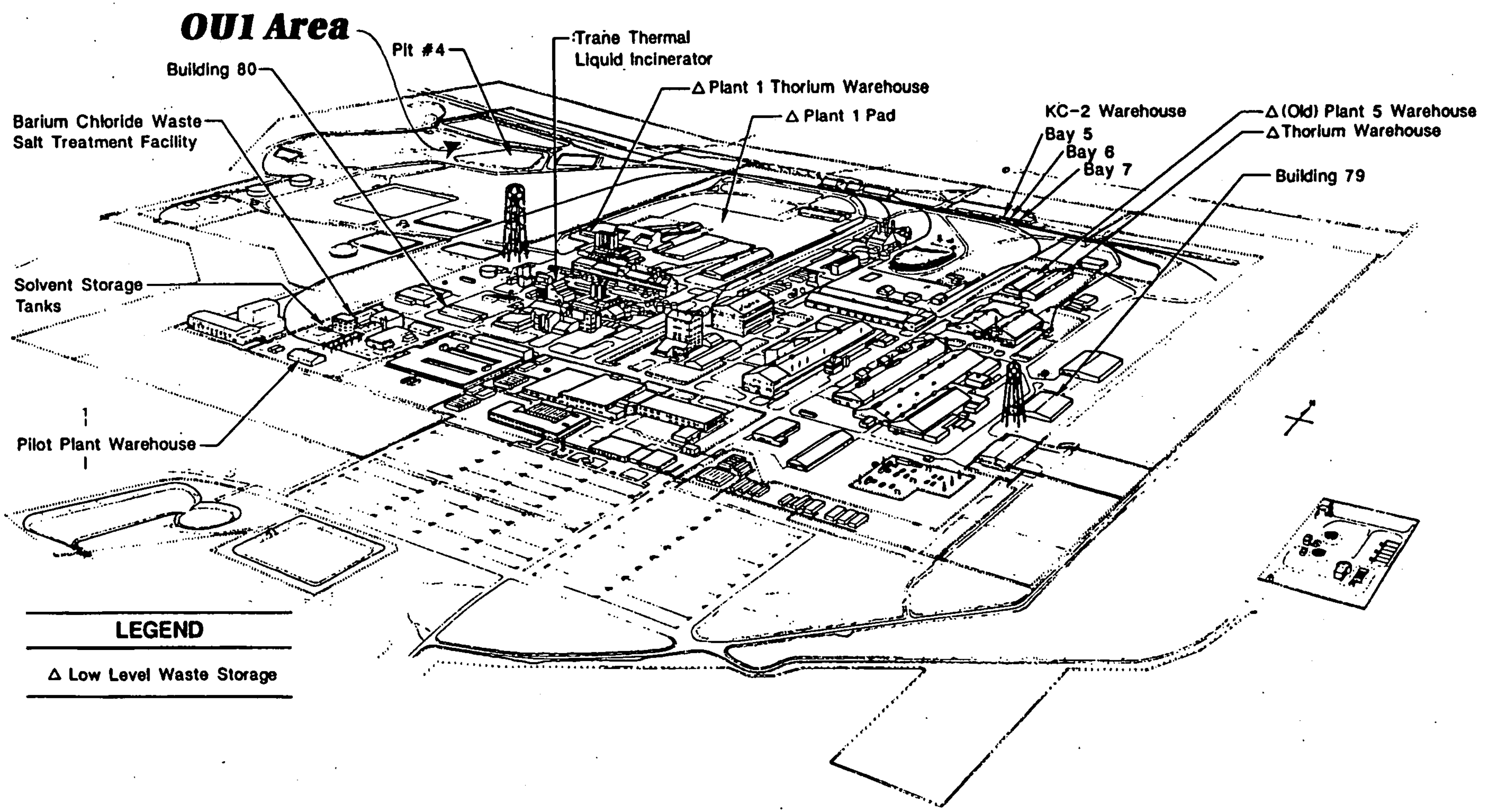

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Figure 3. Operable Unit 1 Plan

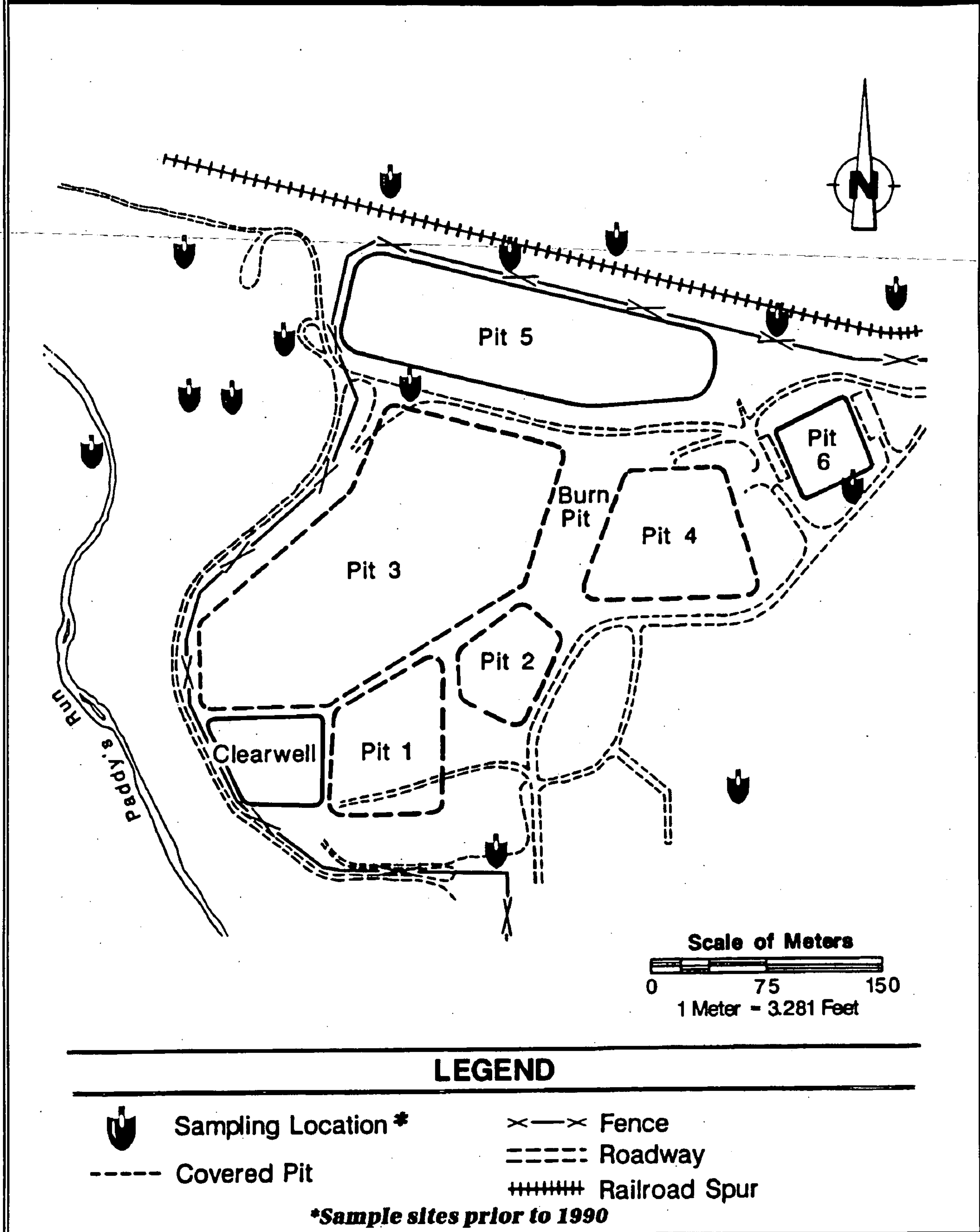

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Figure 4. Aquifer Location at FMPC Site

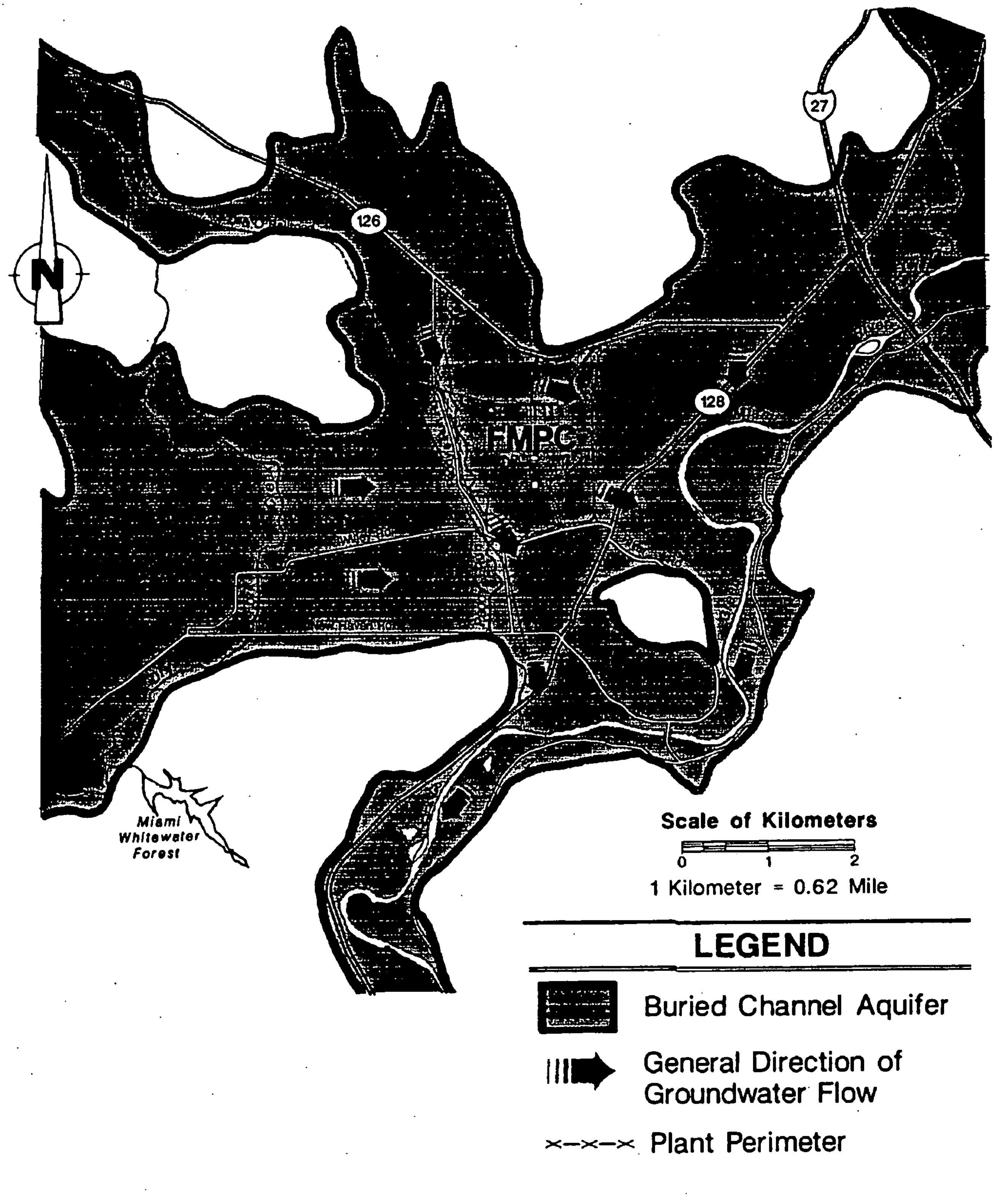

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Table 2. Pit Waste Concentration Ranges for Environmental Media Contaminants of Concern[1]

Contaminant	Background Concentration	Waste Pits Concentration
Radionuclides	pCi/g	pCi/g
Cesium-137	<0.01	Background to 450
Neptunium-237	<0.01	Background to 46
Plutonium-238	<0.01	Background to 4.4
Plutonium-239/240	<0.01	Background to 15
Radium-228	1.25	Background to 440
Strontium-90	0.5	Background to 140
Technetium-99	<0.9	Background to 3,000
Thorium-230	1.85	Background to 12,000
Thorium-232	1.24	Background to 840
Uranium-234	0.94	Background to 18,000
Uranium-235/236	0.13	Background to 8,800
Uranium-238	0.92	Background to 42,000
Inorganics	mg/kg	mg/kg
Antimony	6.7	Background to 320
Beryllium	0.62	Background to 27
Cadmium	0.59	Background to 39
Chromium	19.	Background to 1,500
Manganese	922.	Background to 20.000
Mercury	0.29	Background to 5.1
Molybdenum	2.7	Background to 1.400
Nickel	28.5	Background to 1.700
Silver	2.2	Background to 760
Thallium	0.43	Background to 110
Total Uranium	3.68	Background to 120,000
Vanadium	36.9	Background to 9,700

Table 2. Pit Waste Concentration Ranges for Environmental Media Contaminants of Concern[1]

Contaminant	Background Concentration	Waste Pits Concentration
Organics		g/kg
Benzo(a)anthracene	N/A	Undetected to 130,000
Benzo(a)pyrene	N/A	Undetected to 120,000
Benzo(b)fluoranthene	N/A	Undetected to 130,000
Benzo(k)fluoranthene	N/A	Undetected to 75,000
Chyrsene	N/A	Undetected to 100,000[2]
Dioxins	N/A	Undetected to 45.9[2]
Furans	N/A	Undetected to 14[2]
Indeno(1,2 ,3-cd)pyrene	N/A	Undetected to 46,000
PCBs	N/A	Undetected to 13,000
Tetrachoroethene	N/A	Undetected to 29,000
Vinyl chloride	N/A	Undetected to 1,900

[1] Only concentration ranges for chemicals determined to be Contaminants of Concern in Environmental Media are shown on this table

[2] Concentration range is for individual chemicals or congeners.

SOURCE: Tables 4-1.1A to 4-1.8C. Final Remedial Investigation Report for Operable Unit 1. (DOE. 1994).

TABLE5-1.ROD

Table 3. Operable Unit 1 Constituents of Concern for Environmental Media

Contaminant	Sediment	Air	Surface Soil	Ground Water	Perched Water	Surface Water
Radionuclides						
Cs-137	X	X	X			X
Np-237		X	X		X	
Pu-238		X	X	X		X
Pu-239/240	X	X	X			
Ra-228 + 1 dtr		X				
Sr-90 + 1 dtr		X	X		X	X
Tc-99		X	X	X	X	X
Th-230		X	X	X	X	
Th-232 + 10 dtr	X	X	X		X	
U-234		X	X	X	X	X
U-235 + dtr	X	X	X	X	X	X
U-238 + 2 dtr	X	X	X	X	X	X
Inorganic Compounds						
Antimony			X			
Beryllium	X	X	X			
Cadmium		X	X			
Chromium		X	X		X	
Manganese		X	X	X	X	
Molybdenum		X	X		X	
Mercury		X	X			
Nickel		X	X		X	
Thallium	X	X	X			
Uranium		X	X	X	X	X
Vanadium		X	X			

Table 3. Operable Unit 1 Constituents of Concern for Environmental Media

Contaminant	Sediment	Air	Surface Soil	Ground Water	Perched Water	Surface Water
Organic Compounds						
Benzo(a)anthracene		X	X			
Benzo(a)pyrene		X	X			
Benzo(b)fluoranthene			X	X		
Benzo(k)fluoranthene			X	X		
Chrysene		X	X			
Dioxins			X	X		
Furans			X	X		
Indeno(1,2,3-cd)pyrene		X	X			
PCBs		X	X			
Tetrachlorethane						X
Vinyl Chloride				X	X	

TABLE6-9.ROD

Table 4. Moisture Content Comparison

(All numbers listed as percent moisture on a dry basis)

Location or Sample	In-Situ[1] (Soil Class)	Liquid Release[2]	Optimum Moisture[3]	Saturation Moisture[4]	Flowable[5]
Pit 1	17.2(GC)		17.2		
Pit 2	31.9(MH)		17.5		
Pit 3	55.9/57.0(MH) 43.3/41.6(ML)		26.4		
Pit 4	24.0/28.5(ML)		18.2		
Pit 5	189.5(MH)		50.4		
Pit 6	60.4/50.5(ML)		23.0		
Burn-Pit	30.1/29.2(SM) 30.2(ML)				
Clearwell					
NP1 (Pits 1 & 2)		18.75	13.4		
NP1 (Pits 5 & 6)		44.31	36.2		
MH1 (Pit 5)		56.86	56.0		
MH2 (Pits 2 & 3)		35.93	35.4		
ML (Pit 6 & BP)		29.75	19.9		
CL (Pit 4)		22.88	18.7		
SM (Pit 4 & CW)		23.49	20.1		
Surrogate B3-5		53.49		50.61	36.05
Surrogate B4-5		28.61		32.98	20.63

TABLCRU1.BRF

[1] Roy F. Weston Study, 3/1/88. Sample taken from the top of the waste down to 4-5 feet below the surface.

[2] CRSP Study, 11/94. Sample placed under 50 lb/in^2 load in an attempt to extract free liquid. The moisture listed is the highest moisture content at which the sample released no free liquid.

[3] Optimum moisture for compaction. The numbers listed by pit are from the Weston Study[1]. The numbers listed by soil type are from the CRSP Study[2].

[4] Flow properties test report, Jenike and Johnson, 11/94. Saturation moisture was determined at a consolidating pressure of 3,200 lb/ft^2 (effective to 40 foot head).

[5] Flow properties test report, Jenike and Johnson, 11/94. Moisture content at which reasonable "flowability" was achieved.

DESCRIPTION OF PRESENT DESIGN

PROJECT: REMEDIAL ACTIONS AT OPERABLE UNIT 1

Selected Remedy:
The ROD for OU1 was completed January 26, 1995. The selected remedy for the OU1 site consists of (taken in whole or part from the ROD):

- Construction of waste processing and loading facilities and equipment.
- Removal of water from open waste pits for treatment at the site's waste water treatment facility.
- Removal of waste pit contents, caps and liners, and excavation of surrounding contaminated soil.
- Confirmation sampling of waste pit excavations to verify achievement of remediation concentration levels.
- Pretreatment (sorting, crushing/shredding) of waste pit material.
- Treatment of the waste by thermal drying as required to meet the waste acceptance criteria of the disposal facility (Envirocare, Utah site planned).
- Waste sampling and analysis prior to shipment to ensure that the waste acceptance criteria of the disposal facility are met.
- Off-site shipment of waste for disposal at a permitted commercial waste disposal facility. (Estimate of low-level radioactive waste excavated and disposed of is over 600,000 yd^3.)
- If any waste (up to 10 percent assumed) exceeds commercial site acceptance levels, for radiological considerations, it will be disposed of at the Nevada Test Site.
- Drying equipment, and associated remedial facilities, and oversized materials amenable for wasting at the OU3 site will be decommissioned, decontaminated, and forwarded to OU3 for waste disposal as construction rubble.
- Residuals amenable to remedy as documented in the OU5 ROD will be disposed of in that manner. (All other residuals will be disposed of as the waste pit materials shipped off-site.)
- Excavated locations will be backfilled and cover system placed over it.

The final site area will remain under the control of the Government with security measure in place. Construction and site operations, as well as the final site configuration will be performed in such a manner as to minimize environmental impacts to the region.

Remedy Design Assumptions During Study Period:
- Excavation and movement of material will be by specified mechanical equipment which will be decontaminated and recycled, or if required, dismantled and placed in OU5 site as rubble.
- Crusher/shredder will be used to generate uniform sized materials.
- Heater/dryer will be natural gas with normal venting of combustion products and cleaning of the drying product gases/liquids. Cooling coils will be treated as part of dryer.
- Final products to be shipped will be loaded using disposable liners in railcars for transport. These railcars will be decontaminated, cleaned, and ultimately returned to service (recycled) upon completion of the remedial work.

DESCRIPTION OF PRESENT DESIGN

PROJECT: REMEDIAL ACTIONS AT OPERABLE UNIT 1

Table 5. Disposal Costs at Envirocare

Percent Moisture (By proctor test)	Disposal Costs (per yd^3 material)
5%-23%	$7.86
23%-33%	$7.41
33%-50%	$8.00

A penalty of 5 times the disposal cost ($7.86x5) is assessed in the situation where moisture measurement falls below 5 percent. Railcars exhibiting free liquid may be turned back (paint test used) regardless of moisture content measurement.

The general proposed layout for the facilities are shown in Figure 5. A general flow diagram of the remediation system concept design is shown in Figure 6.

Figure 5. Operable Unit 1 Remedy Plan

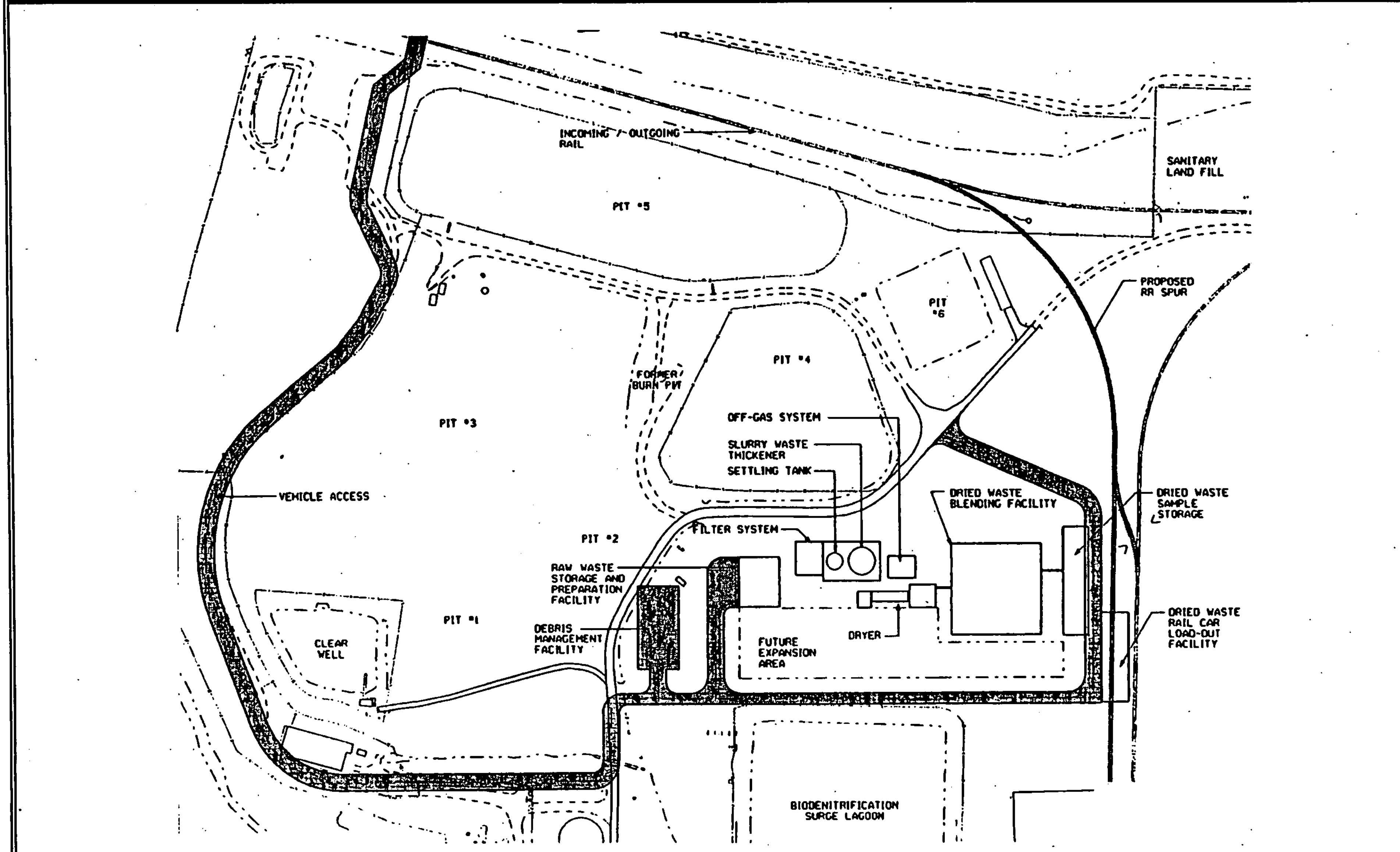

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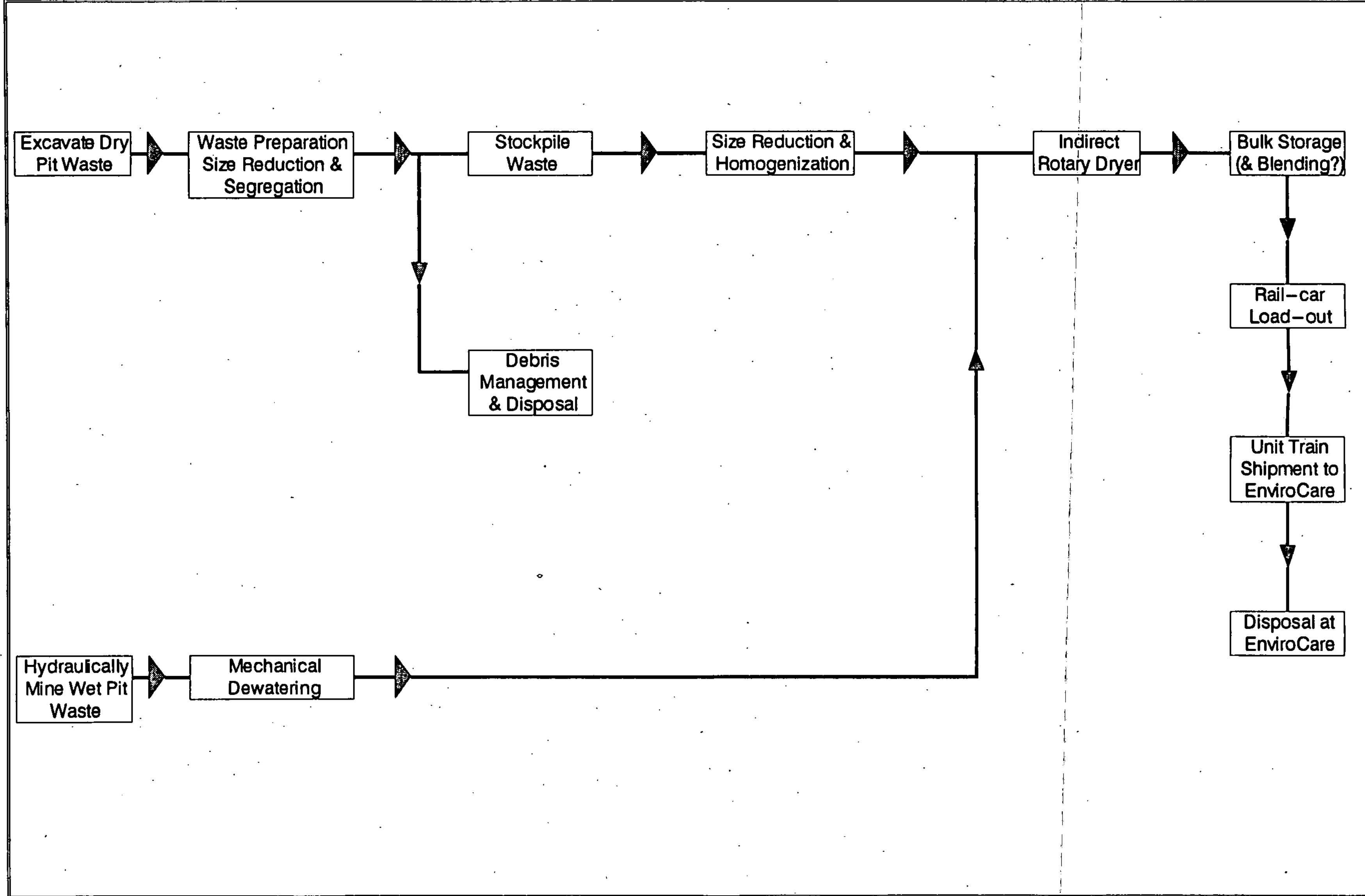
Figure 6. Remediation System Conceptual Design



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SPECIAL CRITERIA SUMMARY

USERS:
• Local population, people affected by transportation through their localities, and final destination site population and potential developments.
• Workers involved in cleanup.
CODES:
• A large variety of Federal, State (principally Ohio, Utah, and Nevada), and local environmental and transportation codes apply to the remedy activities. See documents consulted for specifics related to those codes.
RESTRICTIONS:
• Envirocare of Utah has acceptance criteria that must be complied with fully if the material is to avoid being rejected. This criteria includes no free liquids present (ideal from cost standpoint is 5 percent optimum moisture by Proctor Method) and detailed contaminant and debris limits. Site per shipment capacity limits are large but must be followed. Issues related to the site from the State of Utah also apply.
• Waste must be shipped off-site pursuant to Ohio Environmental Protection Agency (OEPA) requirements and the local public demand relating to the OEPA requirement.
• Hazardous waste requiring remedy for radionuclides is defined as 1,000 pCi/g.
• The ROD has about 11 months remaining, at the time of the value study, until significant action for remedy must have begun (as defined by the EPA). This requirement must be adhered to unless the minimum 6 months to change, and approximately $25,000,000 cost involved to change the ROD can be justified. (The EPA has taken the position, in the past, that the ROD agreement includes the primary transportation method of rail shipment in unit trains as the primary mode of transport and this implies that a different means would require ROD revision.)
• Union contracts of the site workers are to be adhered to as agreed previously. (Failure to comply with this provision would require significant, time consuming negotiations.)
DESIGN HISTORY: (RESPONSIBILITIES, COMMITMENTS, STATUS, ETC.)
Significant milestones for the OU1 project include: FMPC operations suspended in 1989, determination to formally end production notification to Congress in 1991, Envirocare site license approved for Nuclear Regulatory Commission (NRC) type materials in 1993, remedy feasibility study (final draft) completed in 1994, Final ROD completed in early 1995, and initial conceptual design planning awarded and begun in 1995.

SPECCRIT.TAB

GENERAL DISCUSSION OF VALUE ENGINEERING PROCEDURES USED IN THE VALUE STUDY PROCESS

General

The VE study team used the six-phase VE job plan in its operations. The six basic VE phases and their operations are:

Phase 1. Information Phase

All possible information on the process and operational features within the scope of the study are collected, disseminated, and analyzed. The components making up the features, their functions, and costs are determined. The criteria and limits affecting the project or projects are identified, and if necessary, ranked and/or assigned values. A function analysis system technique (FAST) diagram is generated which shows the "why" and "how" and the "as the result of" or "at the same time" of functions being performed. The results are categorized, assigned to functions of note, and items for potential concentration of study team effort are identified.

Phase 2. Creativity Phase

Creativity methods such as "focused brainstorming" are used to generate the maximum quantity of ideas for consideration by the study team. This phase is also often referred to as the "speculation phase."

Phase 3. Analysis Phase

Ideas generated in the creativity phase are ordered, collected into concepts with similar features, solidified into potential alternatives for proposal, and ranked using one of a variety of techniques. The most common two techniques used for ranking in Reclamation led studies are criteria weighting matrix and evaluation analysis ranking, and performance of the function determination and study team consensus ranking. The resulting ranked potential alternatives are then evaluated with regard to their benefits, advantages, and risks.

Phase 4. Development Phase

Study team members are assigned potential alternatives for further development into viable, efficient, and cost-effective proposals with increased value for the client and/or owner of the product or process.

The development process includes, but is not limited to, using team member expertise; consultation with staff performing the project or process; experts and outside vendors; polling others by survey or other means; consultations with the client and/or owner; and review of information resources (libraries, catalogs, and other materials). Measures required to implement the proposals are identified, and methods to resolve identified potential problems are determined. During this phase, determinations to drop a process from further consideration usually require unanimous acceptance by the study team.

GENERAL DISCUSSION OF VALUE ENGINEERING PROCEDURES USED IN THE VALUE STUDY PROCESS

Phase 5. Presentation Phase

Items demonstrating added value, within the confines of the study team period, are placed in report form for presentation and report documentation as alternative proposals. During this phase, items recommended as alternative proposals must, generally, receive unanimous acceptance by the study team before presentation of the team's report. Items uncompleted or determined to be of potential benefit to the client and/or owner but not studied further by the study team, and demonstrating potential added value, are presented as other items recommended for further study. Other items for further study may, on occasion, require extensive additional development activities beyond that available to the study team to determine if the items actually demonstrate the anticipated added value.

Phase 6. Implementation Phase

The owner, users, client, and other project or process parties take the study recommendations into consideration and evaluate them for implementation. The staff coordinating the VE activity, and if needed, study team members, assist and monitor the evaluation to help all parties in implementing the added value features. Final determination of the value of recommendations is established. The status of the final determination of the recommendations (accepted, partially accepted, "withdrawn" due to the acceptance of another preferred proposal, or rejected) and the value of accepted proposals and/or reasons for a rejection is reported to the coordinating staff. Statistics and VE activity results are compiled and reported to organizational management and Governmental authorities.

VEDISCUS.APP

COST MODEL AND ESTIMATE INFORMATION

The VE Study Team cost model was based on the conceptual design estimates provided by the design team for the ROD as amended for the preferred project design and its optimization. This cost model was developed by the VE Study Team and was used to focus on features with the greatest potential for savings and to highlight potential instances of value mismatch. The ROD life-cycle-cost comparisons were also used to assist the team.

Unit prices were reviewed by the VE Study Team and Construction Estimators to ensure reliability and applicability.

Cost savings and the original design concept estimates are of the same general level of development. It should be recognized that unit costs and estimates may vary as designs are pursued and refined.

COSTPAGE.PG

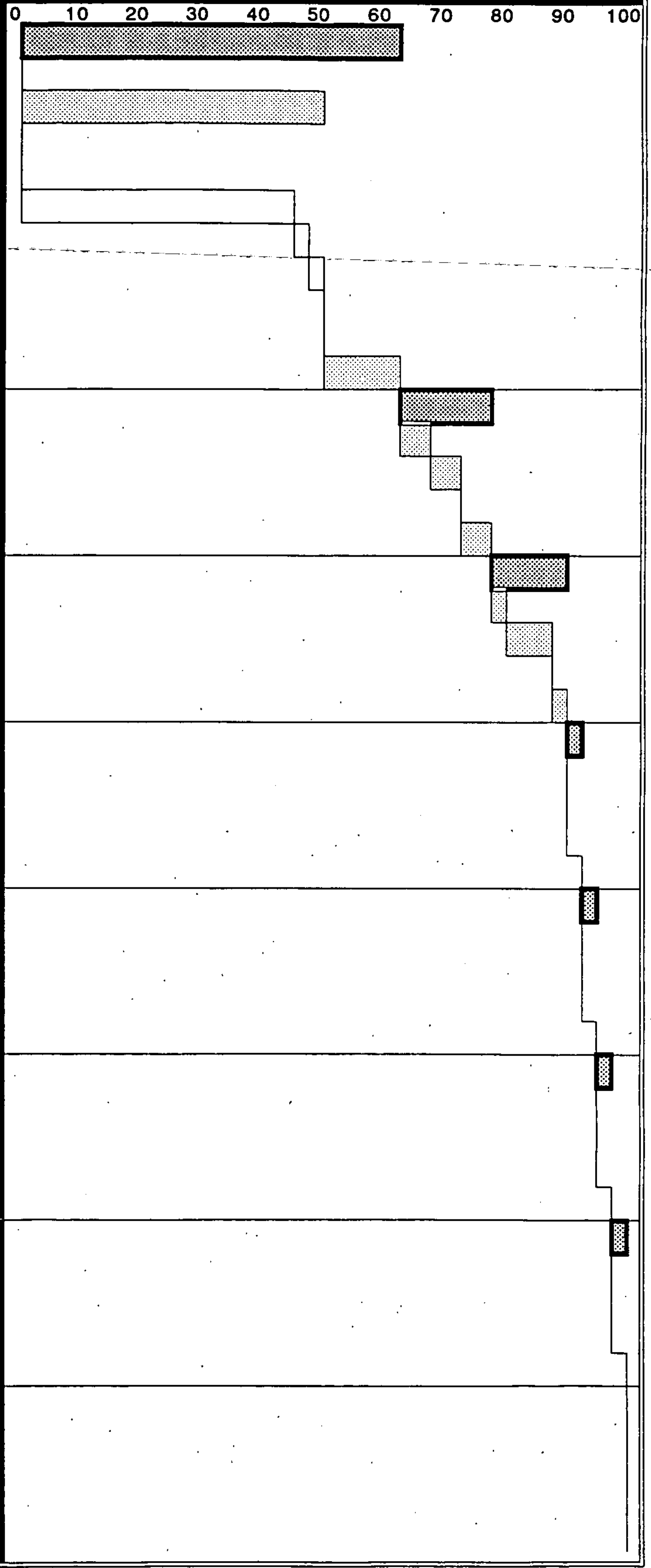
Remedial Actions at Operable Unit 1 (ROD Plan)

VALUE ENGINEERING STUDY

COST MODEL

COMPONENT/PERCENT PROJECT COST	
Shipping and Disposal	**(62.7%)**
Const. Activities	(0.6%)
Indirect/Support	(50.2%)
Indirect	(0.9%)
Support	(49.2%)
Trans/Burial	(46.1%)
Containers	(1.1%)
Soil/Water/Air	(1.8%)
Management	(0.2%)
Engineering	(0.2%)
Risk/Escal/Cont	(11.7%)
Drying	**(15.3%)**
Const. Activities	(4.3%)
Indirect/Support	(5.6%)
Engineering	(1.3%)
Risk/Escal/Cont	(4.0%)
Waste Pit Excavation	**(12.3%)**
Const. Activities	(1.6%)
Indirect/Support	(6.3%)
Engineering	(1.0%)
Risk/Escal/Cont	(3.5%)
Pretreatment Facility	**(2.7%)**
Const. Activities	(0.9%)
Indirect/Support	(0.9%)
Engineering	(0.3%)
Risk/Escal/Cont	(0.6%)
Waste Backfill	**(2.4%)**
Const. Activities	(0.3%)
Indirect/Support	(1.3%)
Engineering	(0.2%)
Risk/Escal/Cont	(0.6%)
Ancillary Facilities	**(1.9%)**
Const. Activities	(0.7%)
Indirect/Support	(0.7%)
Engineering	(0.2%)
Risk/Escal/Cont	(0.3%)
Decontamination & Dismantle	**(1.5%)**
Const. Activities	(0.2%)
Indirect/Support	(0.9%)
Engineering	(0.2%)
Risk/Escal/Cont	(0.2%)
Rail Sidings/Silos	**(1.2%)**
Const. Activities	(0.3%)
Indirect/Support	(0.5%)
Engineering	(0.1%)
Risk/Escal/Cont	(0.3%)

PROJECT COST PROPORTION



VALUE ENGINEERING – LIFE CYCLE COST ANALYSIS

USING PRESENT WORTH (PW) COSTS

Date: 06/15/95

PROJECT: Remedial Actions at Operable Unit 1
COMPONENT: Full Remedy Solutions
Discount Rate: 4.5%
Economic Life: 30

			ALT. 5B (ROD Plan)		ALT. 5A (NTS Site)		ALT. 4A (Vit.)		ALT. 4B (Conc Enc)	
			Estimated Costs	Present Worth	Estimated Costs	Present Worth	Estimated Costs	Present Worth	Estimated Costs	Present Worth
INITIAL/COLLATERAL COSTS										
A. *Ancillary Facilities*			$9,639,476	$9,639,476	$9,639,476	$9,639,476	$9,639,476	$9,639,476	$9,639,476	$9,639,476
B. *Waste Pit Excavation (5 Years)*			$63,300,482	$63,300,482	$63,300,482	$63,300,482			$63,300,482	$63,300,482
C. *Waste Pit Excavation (10 Years)*							$105,721,824	$105,721,824		
D. *Waste Pit Backfill (5 Years)*			$12,390,286	$12,390,286	$12,390,286	$12,390,286			$12,390,286	$12,390,286
E. *Waste Pit Backfill (10 Years)*							$22,761,895	$22,761,895		
F. *Pretreatment Facility*			$13,633,100	$13,633,100	$13,633,100	$13,633,100	$13,633,100	$13,633,100	$13,633,100	$13,633,100
G. *Rail Siding and Silos*			$6,256,980	$6,256,980						
H. *Rail Siding Only*					$6,305,811	$6,305,811				
I. *Rotary Drying (5 Years)*			$78,265,742	$78,265,742	$78,265,742	$78,265,742			$78,265,742	$78,265,742
J. *Rotary Drying (10 Years)*							$122,119,097	$122,119,097		
K. *Vitrification Equipment and Operations*							$242,892,775	$242,892,775		
L. *Cementation Equipment and Operations*									$141,427,913	$141,427,913
M. *D&D Vitrification*							$10,835,586	$10,835,586		
N. *D&D Off-Site Disposal*			$7,828,297	$7,828,297	$7,828,297	$7,828,297				
O. *D&D Cementation*									$7,827,943	$7,827,943
P. *Shipping and Disposal (NTS)*					$664,739,088	$664,739,088				
Q. *Shipping and Disposal (Commercial)*			$321,736,197	$321,736,197						
R. *On-Site Disposal, Cementation*									$197,961,981	$197,961,981
S. *On-Site Disposal, Vitrification*							$126,632,772	$126,632,772		
T.										
U.										
V.										
Total initial/Collateral Costs				$513,050,560		$856,102,282		$654,236,525		$524,446,923
REPLACEMENT/SALVAGE (Single Expenditures)	Year	PW Factor								
A. *Borrow Pit Restoration upon Completion*	5.0	0.8025							$616,440	$494,663
B. *Borrow Pit Restoration upon Completion*	10.0	0.6439					$616,440	$396,943		
C.										
D.										
E.										
F.										
G.										
Total Replacement/Salvage Costs								$396,943		$494,663
ANNUAL COSTS	Escal. Rate	PWA Facto w/Escal.								
A. *Operation and Maintenance*		16.289	$63,722	$1,037,961	$63,722	$1,037,961	$280,796	$4,573,855	$280,796	$4,573,855
B.										
C.										
D.										
Total Annual Costs				$1,037,961		$1,037,961		$4,573,855		$4,573,855
TOTAL PRESENT WORTH COSTS				$514,088,521		$857,140,243		$659,207,323		$529,515,441
LIFE CYCLE (PW) SAVINGS						($343,051,722)		($145,118,802)		($15,426,920)

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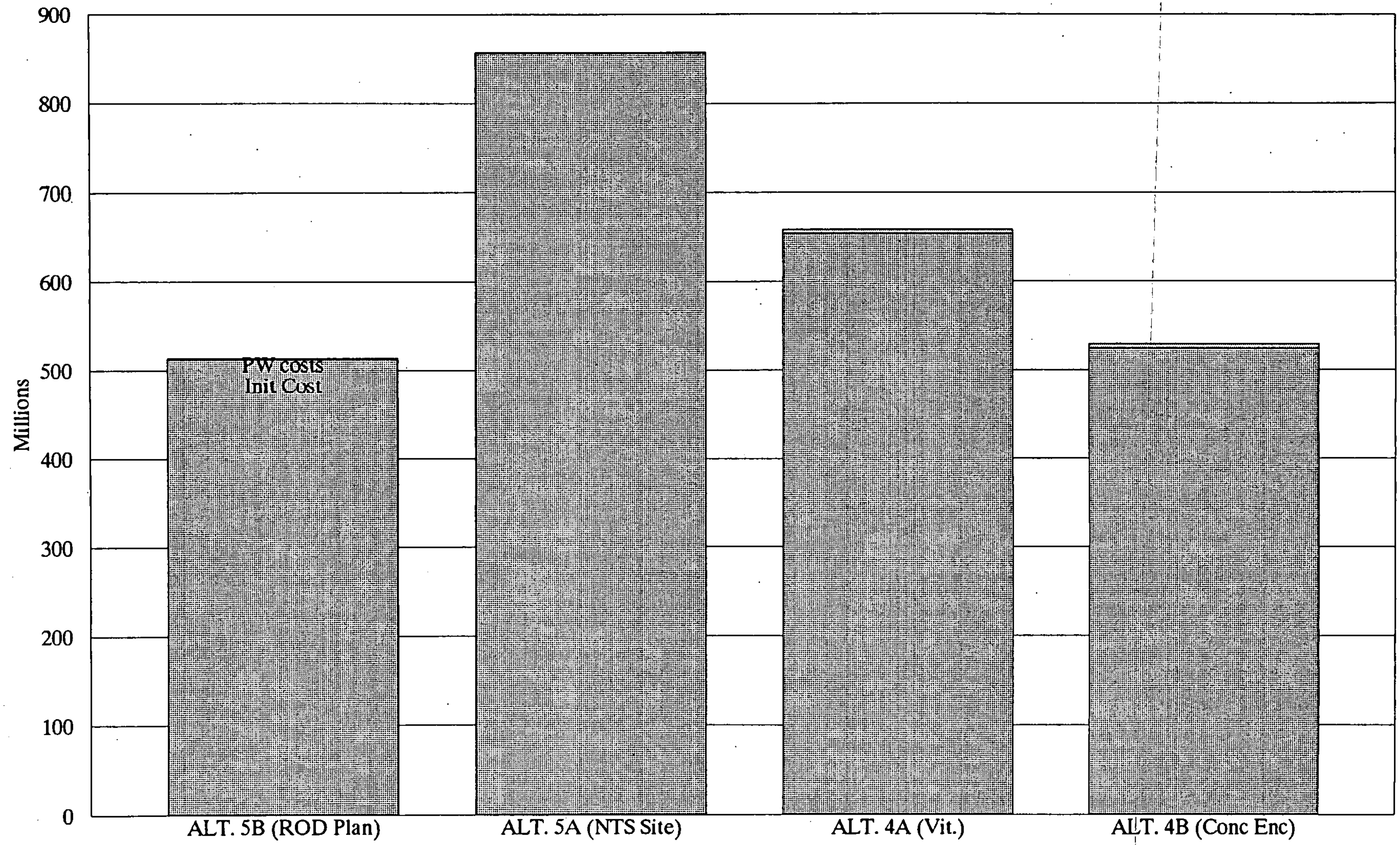
VALUE ENGINEERING – LIFE CYCLE COST ANALYSIS

USING PRESENT WORTH (PW) COSTS

Date: 06/15/95

PROJECT: Remedial Actions at Operable Unit 1 DISCOUNT RATE: 4.5% ECONOMIC LIFE: 30 YEARS



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FUNCTION ANALYSIS

PROJECT: REMEDIAL ACTIONS AT OPERABLE UNIT 1

STUDY ITEM: ROD REMEDY PLAN

COMPONENT	VERB (ACTIVE)	NOUN (MEASURABLE)
OU1 Remedy	Remedy	Contamination
Facilities to Support Operations	Support	Workers
	Supply	Utilities
	Increase	Productivity
	Improve	Morale
	Maximize	Work-time
	Improve	Health
	Improve	Safety
Waste Pit Excavation and Backfill	Remove	Waste
	Acquire	Control(Contaminant)
	Create	Void
	Increase	Mobility(Aquifer/Waste)
	Stabilize	Surface
	Improve	Drainage
	Restore	Habitat(Riparian)
	Prevent	Contamination(By-products)
Pretreatment Facilities	Inventory	Waste
	Segregate	Debris
	Reduce	Size(Debris)
	Prepare	Feed
	Facilitate	Handling(Waste)
	Determine	Characteristics
	Control	Flow
	Remove	Fluids
	Homogenize	Waste
	Optimize	Feed
	Optimize	Radionuclides
	Create	Uniformity
	Create	By-products
	Treat	By-products
Rail Sidings and Silos	Allow	Transportation
	Generate	Difficulty(Movement)
	Prepare	Site
	Verify	Treatment
	Ensure	Quality
	Strengthen	Track(Railroad)
	Add	Track(Railroad)
	Create	Storage(Waste)
	Optimize	Radionuclides

FUNCTION ANALYSIS

PROJECT: REMEDIAL ACTIONS AT OPERABLE UNIT 1

STUDY ITEM: ROD REMEDY PLAN

COMPONENT	VERB (ACTIVE)	NOUN (MEASURABLE)
Dryer Facility and Operations	Reduce Satisfy Improve Reduce Reduce Reduce Remove Increase Treat Create	Cost Criteria(Acceptance) Handling Risk(Transportation) Contamination Weight Liquid Mobility(Dust/Waste) By-products By-products
Decommission and Disposal Activities	Acquire Reduce Recover Minimize Recycle Protect Restore	Control(Contaminant) Volume Cost(Equipment) Waste Equipment Worker Environment
Shipping and Commercial Disposal	Remove Reduce Restore Eliminate Consolidate Show Satisfy Protect Remove	Material Risk Environment Contamination Waste Action Stakeholders(Public) Aquifer Hazard
Post Remediation Operation and Maintenance (O&M)	Control Measure	Site Success

FUNCANAL.TAB

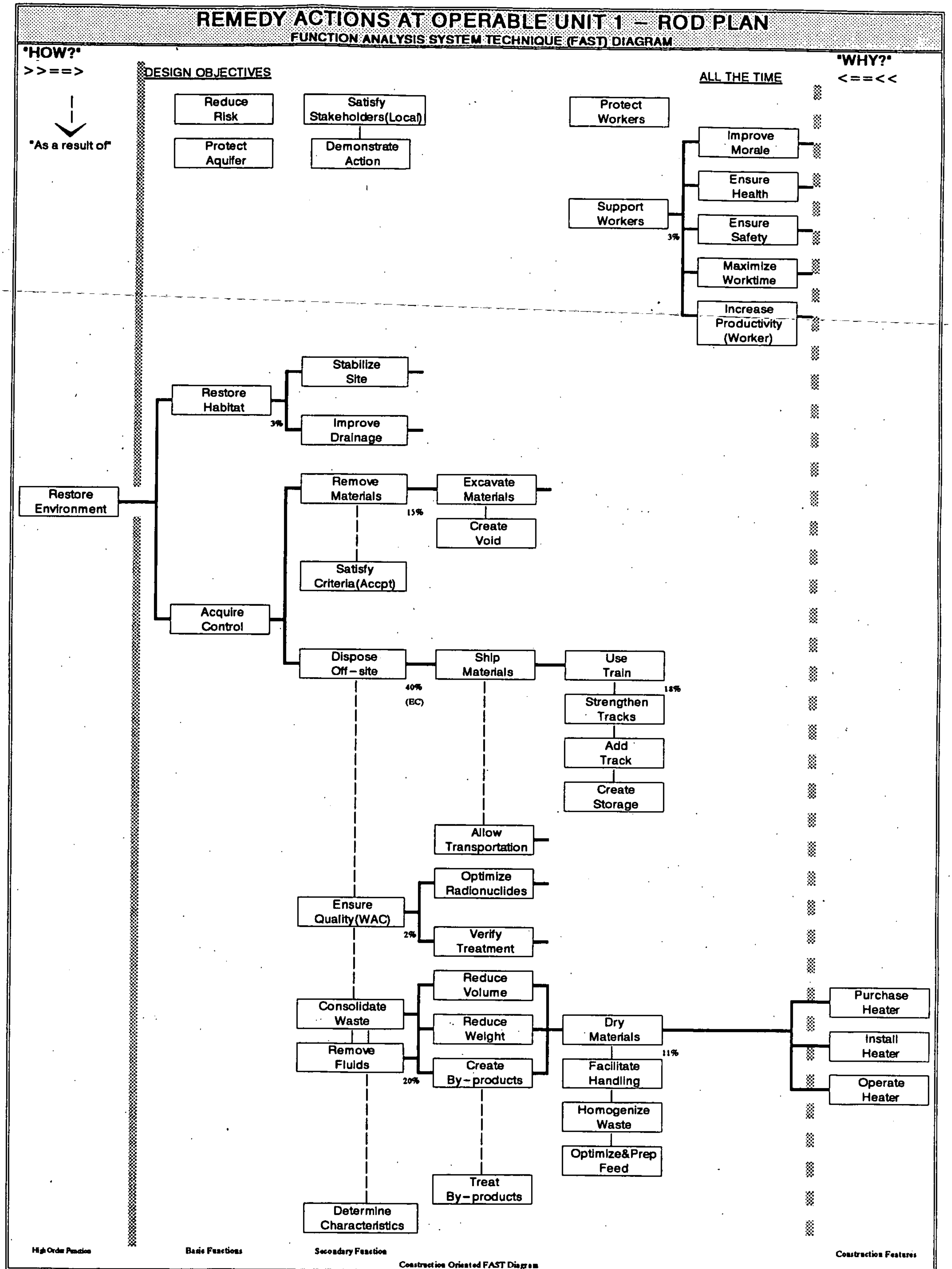
Function Analysis System Technique (FAST)

The VE Study Team used the function analysis process to generate the previous Function Analysis System Technique (FAST) diagram for the ROD conceptual plan as presented to the VEST. The FAST is designed to show the present conceptual design preferred alternative from a functional point of view. The function analysis and resulting FAST diagram aided the VE Study Team in identifying design features that are critical to meeting requirements that support the critical functions, and those that meet noncritical design objectives.

The results of the FAST indicated that the bulk of the project (more than 90 percent) is related to the decision to place the material off-site. The largest portion of the costs are in the disposal fees (about 40 percent) with another 18 percent used in transporting (by rail) from Fernald to the Utah site.

The supporting function Consolidate Waste is not on the critical path and is therefore defined (in VE terms) as a "potential value mismatch" due to its large cost, between 12-20 percent in relation to the project, and the fact that it is not a primary purpose for the project. This indicated that a concentration of study team efforts (or design team efforts) to avoid or reduce the cost of this feature should add large value related increases to the project. (Provided the effect on the related critical path function Dispose Off-site costs were unaffected or could be reduced within the effort.)

FASTDIAG.PG



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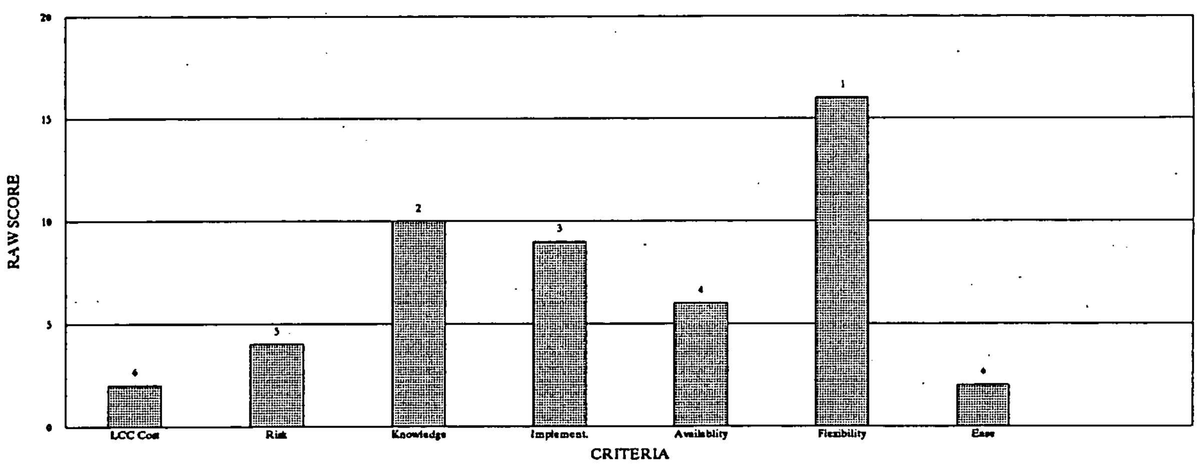
(Percentages shown are approximate and are based upon the most recent project estimate given by Parsons on 6/29/95.)

CRITERIA WEIGHTING PROCESS

PROJECT:	Remedial Actions at Operable Unit 1		
COMPONENT:	ROD Remedy Plan	FUNCTION: Restore Environment	

	CRITERIA	RAW SCORE (WEIGHT)	RANK
A. LCC Cost	Economic life cycle cost of the project/process in its entirity	2	6
B. Risk	Risk that problem will return, off–site contamination will occur, or process will not meet expectations.	4	5
C. Knowledge	Evidence that process has been or can be implemented and is usable for this remedy situation	10	2
D. Implement.	Ease of acquiring, installing, and operating within projected performance and time expectations	9	3
E. Availablity	Amount of downtime is low and operational time is maximimized	6	4
F. Flexibility	Flexibility (robust, forgiving, and tolerant) of operator and material being used	16	1
G. Ease	Low maintenance and/or ability to operate and maintain within an acceptable limit	2	6
H.			



How Important:

4 – Major preference
3 – Medium preference
2 – Minor preference
1 – Letter/Letter – no preference each score one point

	B	C	D	E	F	G	H
A other number	B 2.333	C 1.5	A D 1	E 2	A F 1	G 2.167	
B other number		C 3.167	D 2.333	E 2.167	F 3.333	B 1.833	
C other number			C D 1	C 2.167	F 2.333	C 2.167	
D other number				D 2.667	F 3.5	D 2.333	
E other number					F 2.833	E 1.833	
F other number						F 2.833	
G other number							

Note : Drop Criteria with a Raw Score of 1
(Criteria which gets dropped may be considered in Advantages/Disadvantages Analysis)

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DESCRIPTION OF SELECTED CRITERIA AND EXPLANATION OF THE WEIGHTING PROCESS

PROJECT: REMEDIAL ACTIONS AT OPERABLE UNIT 1

General Discussion:

Using standard VE procedures, the study team determined that the prior fundamental criteria were the more crucial factors in serving the basic function of the remedy action under study. The resources used by the study team included study team discussion and evaluation of the information provided by: the ROD; applicable laws and regulations; public meeting documents; DOE and contractor staff expertise; staff responsible for ultimate remedy design; VEST expertise; and consultants.

Satisfies and/or Performs the Function. This is a primary and fundamental criteria applicable to all value studies. The basic function identified in the FAST model, shown previously, was restore habitat and acquire control and the higher order function was to restore environment (of the region). The team identified this to mean that the land must be placed in the condition, as stipulated in the ROD, accepted by the local stakeholders. This restoration of the environment is to be by acquiring control of the contaminated media (waste material) by removal and/or treatment.

Criteria Description:

The VEST members definition of the criteria as used in the weighting process were:

LCC Cost: Overall cost of the remedy and consequences over the economic life of the selected ROD period (20 years).

Minimize Risk: Level of the risk for off-site contamination (in-route or at disposal site) and risk that the process will not meet the expectations due to the combination of material and/or equipment unknowns (and its affect on time and/or money).

Knowledge Basis: Degree of evidence that the process has been implemented and/or is usable for this remedy material/contaminant situation.

Implementability: Confidence that the process and/or equipment can be acquired, installed, and operates within the projected performance and time expectations.

Availability: Degree that the process is robust, forgiving, and tolerant of the operator or material being used.

Ease of Operation: Process or equipment has low maintenance and/or the ability to operate and maintain within an acceptable operation limit.

DESCRIPTION OF SELECTED CRITERIA AND EXPLANATION OF THE WEIGHTING PROCESS

PROJECT: REMEDIAL ACTIONS AT OPERABLE UNIT 1

Weighting Process Explanation:

Once the criteria definition was completed, each individual criteria was compared. First, with regard to the highest priority, then a level of priority greater than the priority determined to be lower was determined. In the course of this operation, the original criteria was further defined and clarified as needed until the previous criteria definition and weighting result was determined.

PRESDESC.DES

EXPLANATION OF ALTERNATIVE EVALUATION

PROJECT: REMEDIAL ACTIONS AT OPERABLE UNIT 1

General Discussion:

Over 70 ideas related to the identified basic function(s) shown in the FAST diagram were generated for discussion and evaluation by the study team. These ideas were first evaluated on a pass/fail basis to determine each idea's applicability and potential to meet the basic functions and governing criteria. About 28 of these ideas were determined, by the team, to warrant further evaluation and analysis. The team further identified 17 of these ideas for possible refinement through further study team investigations and used a ranking procedure to guide the team's efforts on these ideas. During that process, the team determined that 11 of the 17 ideas received a rating high enough to warrant team development into potential alternatives. These 11 ideas were then combined, removed, and/or added to other additional ideas and options, identified during the Development Phase (due to refinement of the initial ideas), and the results were ultimately presented as Alternative Proposals.

Explanation and Interpretation of Ranking Procedure Used

Each of the original ideas were first evaluated on a scale of 1 through 5 in terms of the item's capacity (after an expected further development by the study team) to perform the basic functions (restore habitat and acquire control). Each item not receiving a rating of 4 or greater was immediately dropped from further discussion. (The item is presumed to not have a high enough potential for adding value to the mission of the Department of Energy and the ultimate purpose of the remedy, and therefore, further use of the study team resources on the idea was considered to be unjustified.)

Items receiving a 4 or greater rating were further evaluated in terms of the item's potential for meeting the criteria specified shown in the previous matrix. The study team's determined rating for the specified criteria and criteria weight were then multiplied to determine the raw score for the potential alternative.

Potential alternatives with the highest raw score are features identified by the study team to have the highest potential for adding value and were retained for further development as a formal proposal. As additional information became available during the development process, it was often determined that the proposal priority should be reevaluated and/or the concept should be combined with another idea being developed. This was expected as a part of the normal VE process.

The team's evaluation matrix of the initially identified ideas follows. The disposition of all proposals initially retained for possible alternative development are listed in the "disposition of ideas" form which follows the alternative evaluation matrix forms shown.

EXPLALT.DIS

VALUE ENGINEERING – ANALYSIS MATRIX

PROJECT: Remedial Actions at Operable Unit 1

COMPONENT: ROD Remedy Plan — **FUNCTION:** Restore Environment

RATING

5 – EXCELLENT
4 – VERY GOOD
3 – GOOD
2 – FAIR
1 – POOR

ALTERNATIVES		Satisfies and/or performs the function (Relative weight)		FIRST RANK	F. Flexibility (Relative weight)		C. Know-ledge (Relative weight)		D. Implement-ability (Relative weight)		E. Availability (Relative weight)		B. Risk (Relative weight)		A. Cost (Relative weight)		G. Ease (Relative weight)		Total Weighted Value	Final ranking of accept-ance
		Anal	16		Anal	16	Anal	10	Anal	9	Anal	6	Anal	4	Anal	2	Anal	2		
1. Original	Current Operations	4.4	70.4		3.6	57.6	3.8	38	3.4	30.6	2.8	16.8	2.8	11.2	3.6	7.2	2.8	5.6	237	7
2.	Maximize on site storage of all waste	2.4	38.4		--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
3. Overdry	Overdry then add back water to meet WAC	4	64		3.6	57.6	4	40	3.6	32.4	3.6	21.6	3.4	13.6	4	8	3.8	7.6	245	5
4. Slurry	Slurry waste for easier processing	5	80		4.2	67.2	3.6	36	3.8	34.2	3.8	22.8	3.8	15.2	4	8	4	8	271	2
5. Storage	Store waste in Railcar/delete hoppers	4	64		3.4	54.4	3.6	36	4.8	43.2	4.6	27.6	4.6	18.4	5	10	4.4	8.8	262	4
6. Density	Maximize shipped material density	5	80		4.2	67.2	2.6	26	2.8	25.2	2.6	15.6	3.6	14.4	4.4	8.8	2.8	5.6	243	6
7.	Treat fast, store, and ship later (Contingency issue)	2	32		--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
8. Densifier.	Use an exisiting "densifier" technology (POP)	4	64		2.4	38.4	2.8	28	3.2	28.8	3	18	3.6	14.4	3.4	6.8	3.2	6.4	205	9
9:	Use soil washing to reduce volume	3	48		--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
10.	Uncover Pit 5 and let dry	1.8	28.8		--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
11. Innv Dry	Slurry/separate debris/innovative dryer	4.4	70.4		3.8	60.8	3	30	3.6	32.4	3.4	20.4	3.6	14.4	4	8	3.2	6.4	243	6
12.	Use several technologies and scale-up	3.2	51.2		--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
13. Two Dryers	Two dryer option (rotary/pulse)	5	80		4.6	73.6	3.8	38	4	36	4.2	25.2	4	16	4	8	4	8	285	1
14.	Optimize mixing to ensure full cars	2.8	44.8		--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
15. Buliding	Use enclosed building for processing	4.8	76.8		3.6	57.6	3.4	34	4.8	43.2	3.8	22.8	3.8	15.2	3	6	4.2	8.4	264	3
16. Ship It	Ship to Enviro-Care and process there	4.2	67.2		2	32	2.8	28	3	27	1.8	10.8	1.6	6.4	1.4	2.8	4	8	182	10
17. Opt Before	Optimize radionuclides mix before drying	4	64		2.8	44.8	3	30	3	27	3.6	21.6	3.2	12.8	3.8	7.6	2.8	5.6	213	8
18.																				
19.																				

IF RANK VALUE DOES NOT EQUAL OR EXCEED 4 (very good) THE ALTERNATIVE IS DROPPED

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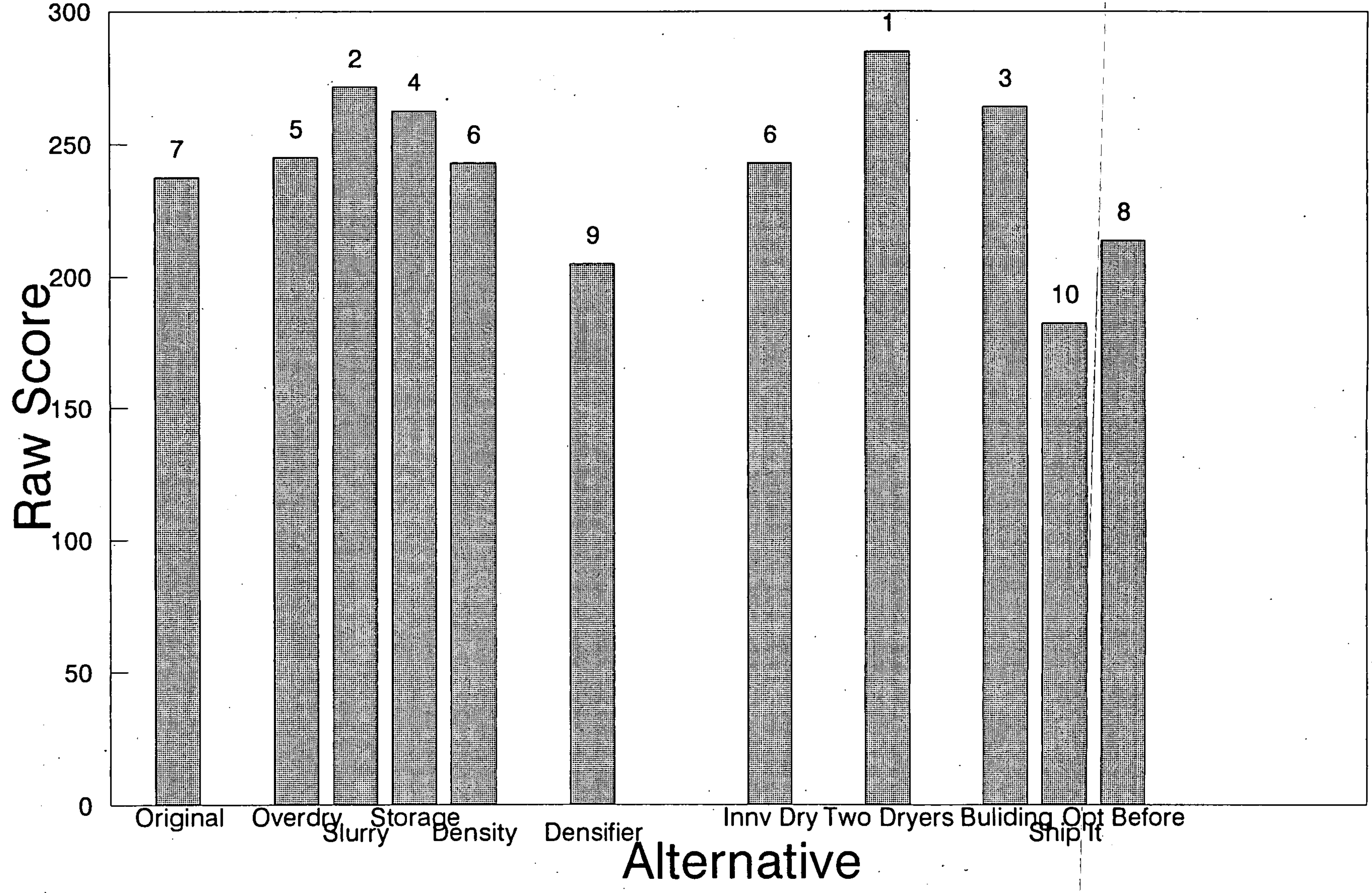
VALUE ENGINEERING – ANALYSIS MATRIX RESULT GRAPH

PROJECT:	Remedial Actions at Operable Unit 1		
COMPONENT:	ROD Remedy Plan	**FUNCTION:**	Restore Environment



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VALUE ENGINEERING - DISPOSITION OF IDEAS

PROJECT: REMEDIAL ACTIONS AT OPERABLE UNIT 1

OTHER VE ELEMENTS CONSIDERED AS POTENTIAL PROPOSALS

IDEA	DISPOSITION
• Use two dryer system, rotary and pulse to handle slurry materials more efficiently and improve flexibility in both direct and slurry type operations.	Combined with overdry and other innovative slurry optimized dryer options, and presented as Alternative Proposal No 2.
• Use innovative dryer system to handle slurry type operations more efficiently.	Combined with overdry and above two dryer system options, and presented as Alternative Proposal No 2.
• Avoid difficulty of obtaining 10 percent moisture due to variable material properties and available technology. Design system at discharge of Indirect Heated Rotary Dryer (IHRD) to add water to reach optimum disposal water content and cool material before railcar loading.	Combined both dryer system ideas discussed above and presented them as Alternative Proposal No 2.
• Use slurry excavation system to allow easier processing and optimization of radionuclide concentrations.	Combined with the presentation information from Alternative Proposal No. 2; utilize slurry option to improve handling characteristics; and the railcar storage options, and presented as Alternative No. 1.
• Utilize slurry to improve handling characteristics of the material to be disposed off-site.	Combined with the presentation information from Alternative Proposal No. 2; the easier processing of radionuclides slurry; and the railcar storage options, and presented as Alternative No. 1.
• Use the railcars as the storage location in place of silos to avoid processed material becoming stuck in silos, and the difficulty of removing material reject on the basis of the waste acceptance criteria.	Combined with the presentation information from Alternative Proposal No. 2; utilize slurry option to improve handling characteristics; and the easier processing of radionuclides slurry options, and presented as Alternative No. 1.

VALUE ENGINEERING - DISPOSITION OF IDEAS

PROJECT: REMEDIAL ACTIONS AT OPERABLE UNIT 1

OTHER VE ELEMENTS CONSIDERED AS POTENTIAL PROPOSALS	
IDEA	**DISPOSITION**
• Ship material to Envirocare and allow them to perform the required treatments for a negotiated fee.	While Envirocare has broached this subject previously, the team's evaluation matrix determined that this alternative lacked sufficient benefits to justify further team action during the study period.
• Shred debris greater than 2-inches and drop into railcar without drying or processing further.	Combined with other ideas and presented in Alternative Proposal No. 1.
• Treat excavated materials as fast as possible, stockpile in interim storage location, and ship to off-site disposal location later (e.g., when processing is near completion).	Recommended for submission as an additional idea for further discussion. Time did not permit final discussion statement writeups. This idea was expected by the study team to apply only if budgetary constraints preclude excavating and treating at economic rates.
• Obtain a firm or other full-time staff person with highly refined negotiating skills to assist in doing negotiations with Envirocare.	Negotiation skills of the staff currently doing this work is very good. However, due to the cost and dependence of the selected remedy on the Envirocare site, additional effort in this area could prove beneficial to the Government and may improve Envirocare's operational parameter's too. Recommended for submission as an additional idea for further discussion. Available study time did not permit final discussion statement writeups.
• Establish contingency plan to stabilize materials at another location rather than Fernald.	Originally expected to be recommended for submission as an additional idea for further discussion. However, it appears that this effort is already being done and no additional recommendation options were noted.
• Look for alternative sites for disposal since disposal is largest single cost item.	This will allow more competition in negotiations and disposal costs. Further, it would assist in other DOE site disposal efforts. Recommended for submission as an additional idea for further discussion. Available study time did not permit final discussion statement writeups.

VALUE ENGINEERING - DISPOSITION OF IDEAS

PROJECT: REMEDIAL ACTIONS AT OPERABLE UNIT 1

OTHER VE ELEMENTS CONSIDERED AS POTENTIAL PROPOSALS

IDEA	DISPOSITION
• Integrate activities with other operable units.	Significant cost savings potential may be present in mixing OU's solutions. Recommended for submission as an additional idea for further discussion. Time did not permit final discussion statement writeups.
• Examine the potential for a cooperative economic and storage activity within DOE, and other Governmental agencies engaged in similar activities, to create a site with railroad tracks, tipping mechanisms, and site preparation required at an alternative site such as Yucca Mountain, Nevada Test Site (NTS), or other location.	Due to the size of the overall DOE effort, as well as the large military effort and other agencies involvement, a combined effort could produce large increased value potential for the ultimate single source of all the funding involved (Government via the taxpayer). Recommended for submission as an additional idea for further discussion. Time did not permit final discussion statement writeups.
• Use performance based private sector contracts.	Recommended for submission as an additional idea for further discussion. Time did not permit final discussion statement writeups.
• Change rules at facility to allow more flexibility in operations.	Recommended for submission as an additional idea for further discussion. Time did not permit final discussion statement writeups.
• Improve communication and access of FERMCO and Parsons to operational and field staff performing this type of work in actual remedy operations.	Recommended for submission as an additional idea for further discussion. Time did not permit final discussion statement writeups.
• Use additive on top of material placed in railcar to remove "free liquid" that may be developed due to transit vibration.	Recommended for submission as an additional idea for further discussion. Time did not permit final discussion statement writeups.
• Fabricate buildings or other temporary structures to handle materials on controlled surfaces in an enclosed space with simple equipment.	Recommended for submission as an additional idea for further discussion. Time did not permit final discussion statement writeups.

IDEASDIS.TAB

VE PROPOSAL DESCRIPTION

PROJECT: REMEDIAL ACTIONS AT OPERABLE UNIT 1

PROPOSAL NO. 1. IMPROVE MATERIAL HANDLING PLAN

Background:
The current OU1 design calls for mechanical excavation of approximately 550,000 yd^3 of pit materials using standard excavation equipment, and hydraulic excavation of approximately 120,000 yd^3 of waste. The pit contents to be excavated by mechanical equipment range from dry to very wet (80 percent to 40 percent by weight solids content).

Waste excavated from the pit by hydraulic means is filtered, thickened, combined with mechanically-excavated waste, dried in an indirect-fired rotary dryer, blended, stored, and loaded onto railcars.

Proposal:
Concern was expressed during the value engineering process for Operable Unit 1 that the current OU1 design process could result in significant materials handling problems due to the inconsistency of the feed material and the difficulty of feeding rotary dryers with some waste materials at certain moisture levels. The value engineering study team proposes that these problems be overcome by utilizing a slurry system to remove a higher percentage of OU1 wastes from the pits. (The bulk of the existing slurry system equipment may be sufficient to handle the additional amounts recommended in this proposal; therefore, this recommended additional slurry operation would be an increase in the amount of the equipment used and not an increase in the number of pieces of slurry equipment at the site.)

This proposal remains consistent with the Record of Decision and it would facilitate blending, pretreatment, and waste storage, thereby reducing cost in these areas also.

VALUE ENGINEERING
ALTERNATIVE EVALUATION PROPOSAL NO. 1

PROJECT: REMEDIAL ACTIONS AT OPERABLE UNIT 1	
COMPONENT: Excavation/Handling	**FUNCTION:** Remove Waste

ALTERNATIVE DESCRIPTION

- Provide capability to slurry more waste than is currently planned.

BENEFITS	DISADVANTAGES
• Reduces material handling problems in OU1 process. • Facilitates blending of wastes before drying to produce a more consistent feed; and thereby, improve control of dried waste characteristics. • Reduces or eliminates need for post-drying storage/holding of waste to ensure compliance with the off-site Waste Acceptance Criteria (WAC). • Little additional slurry processing equipment needed as existing equipment should be adequate to handle additional quantity.	• Would require that an innovative slurry drying system be added to the OU1 process. • Increases system complexity due to added dryer system.

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VALUE ENGINEERING PROPOSAL NO. 1

PROJECT:	REMEDIAL ACTIONS AT OPERABLE UNIT 1		
COMPONENT:	Excavation/Handling	**FUNCTION:**	Remove Waste

ORIGINAL CONCEPT	VE CONCEPT
• Use standard excavation equipment to remove pit waste from all pits except for 88,110 yd^3 of Pit 3 and 30,750 yd^3 of Pit 5 which will be removed by slurry method.	• Use slurry system to remove an additional 150,000 yd^3 of the pit waste through slurry operation method. • Add two 250,000 gallon slurry tanks and two 300 gal/min slurry pumps and miscellaneous slurry equipment at an estimated cost of less than $1 million. • Recover, decontaminate, and send 4,000 tons of debris to on-site cell rather than dry and ship to Nevada ($168/ton shipping and disposal cost and $94/ton operating cost or $1,048,000).

COST ITEMS	NONRECURRING*	LIFE CYCLE*
ORIGINAL CONCEPT		$ 109,041,000
VE CONCEPT (-)		$ 108,992,000
SAVINGS		$ 49,000
NUMBER OF UNITS (X)		1
TOTAL SAVINGS		$ 49,000
VE STUDY COSTS (-)		$ 39,000
IMPLEMENTATION COSTS(-)		
NET SAVINGS		$ 10,000

* CHOOSE ONE METHOD-USE NONRECURRING IF LIFE CYCLE COSTING DOES NOT APPLY.

VEALTMON.TAB

Note: While the above cost savings estimate performed within the time frame of the value study was without measurable savings (within the scope of the known issues involved) the study team determined that, regardless of measurable savings determination, the added value of the handling enhancements were sufficient to justify presentation of this proposal. Further, the potential for cost overruns after commencement of the remedial activities due to material handling difficulties was not estimated with regard to cost, but would be avoided by adoption of this proposal.

IMPLEMENTATION OF PROPOSAL NO. 1

CRITICAL ITEMS TO CONSIDER:

- The difficulty of handling the high-fluid content material with cohesive properties and the inefficiency of an indirect dryer on such materials.

PROBLEMS AND HOW THEY CAN BE OVERCOME:

- Indirect rotary dryer will not work efficiently on slurry feeds. This problem would be overcome by installing an innovative dryer (such as a pulse dryer).

PROCEDURES: (WHO DOES WHAT)

- FERMCO/PARSONS must examine the available information to verify the concept and develop process basis and improved rough order of magnitude estimate of construction and operating cost.
- FERMCO/DOE must confer and reach a consensus to pursue the extent of the slurry system (must decide how much of pits to slurry) to be used on the pit material.
- PARSONS will need to gather additional information on hydraulic excavation and slurry feed system and incorporate in the remedial design packages for OU1 if justified.

SUMMATION OF BENEFITS AND DRAWBACKS OF THE VE PROPOSAL:

Benefits: Addresses concern regarding material handling problems and Improves operating flexibility.

Disadvantages: Will require innovative dryer and increases complexity.

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VE PROPOSAL DESCRIPTION

PROJECT: Remedial Actions at Operable Unit 1

PROPOSAL NO. 2. IMPROVE DRYING SYSTEM FLEXIBILITY

Background:
The current preliminary design utilizes a single IHRD to reduce the moisture level of all OU1 materials (approximately 653,500 dry tons) to 10 percent moisture prior to shipment to Envirocare for disposal. Moisture content is significant from the standpoint of transportation costs and possible surcharges from Envirocare for not meeting optimum specifications. It may also be a safety issue, since dusting will occur if over-drying occurs. The excavation plan presented to the VEST proposed to remove about 20 percent of the material by slurrying. The slurried material will be thickened to 40 percent solids and then dewatered to 65 percent solids using a vacuum filter. Slurry removal will, by design, remove any debris larger than 2- to 4-inches (exact size at time of study was still being determined). The remaining 80 percent will be excavated, screened to 6-inches, and stored for feeding to the drier. The existing plan calls for shredding the debris to less than 4 inches. The excavated and screened soil, along with the minus 4-inch shredded debris, is then fed to the IHRD.

The current proposed IHRD design is 10 feet diameter by 60 feet long (heated cylinder dimensions). The cylinder is a high-nickel alloy allowing shell temperatures up to 1,600°F which require refractory lining of the furnace shell. The uninstalled price of $2,528,700 does not include the off-gas treatment system. (The details for the thermal capacity were not found in the documentation reviewed by the VEST.) The thermal capacity was specified to be able to dry media having moisture ranging from 23 percent to greater than 65 percent.

It is impossible with the available data to completely characterize all the contaminated media in OU1. Much of the existing data used soil classification categories based on particle size. A significant amount of the media was created by on-site waste processing and may not behave like the soil classification categories it has been put into by present data tests. This anomaly is recognized and referred to several times in the DRAFT/June 1995, *OU1 Waste Processing Cost Comparison Study Interim Report* prepared by Parsons. Essentially, everyone in the VEST recognized that it is not practical from an economic or time constraint to gather all possible data before designing and implementing a remedy.

Proposal:
Existing data were utilized to propose a slightly different design from the original presented concept that can dry the OU1 media in a reasonable time period (6-12) years, at a lower cost, and with more flexibility (even if as much as 25 percent of the media does not behave as anticipated). To assist in this effort Table 6 was prepared from data in Table 1 of this report and from a table in a cost estimate supplied by FERMCO as a result of Mr. Thurle Moss's (VEST member) efforts.

VE PROPOSAL DESCRIPTION

PROJECT: Remedial Actions at Operable Unit 1

This proposal recommends installing two different dryer type designs; an IHRD similar to the current design, except smaller and less expensive; and a pulse dryer designed for drying pumpable fluids (slurries). The pulse drier characteristics allow it to accept almost any feed stream that can be pumped through a 1.5-inch-diameter pump. Further, it is not well suited to producing product below 5 percent residual moisture. This is actually for the project, since the plan is to dry to 10 percent moisture. Also, the pulse dryer is ideally suited for media that is excavated using the slurry method and it is energy efficient, since it only requires approximately 1,400 BTU's to remove a pound of water. Unfortunately, from a contractual viewpoint, the pulse dryer reviewed within this study was only produced by one manufacturer in the United States. A search for other dryer suppliers or designs will be necessary to meet Government requirements.

The current concept ROD design utilizes an IHRD for drying all the OU1 media. Unfortunately, on a wet basis, it is estimated that 15 to 40 percent of the materials will have moisture content in excess of 50 percent. These wet materials are not well suited for an IHRD, because of its low thermal efficiency of 3,000 to 3,500 BTU's to remove a pound of water.

Also, an IHRD is slow and its responsiveness is not robust. The typical residence time to dry is 20 to 60 minutes. Because of feed differences and variations in feed rate, controlling the exit product moisture to match the target 10 percent with any attained precision may be very difficult. Therefore, as a part of this proposal, it is recommended that a product cooler/moisturizer be added at the product discharge from the IHRD. The cooler/moisturizer is essentially a closed mixer to add water back to the treated soil, that provides the needed control of the treated soil moisture content.

The proposed IHRD would be capable of processing approximately 20 tons per hour for feed with 23 percent moisture and 11 tons per hour at 45 percent moisture. The pulse drier would be sized for 12,000 pounds per hour of water, or about 10 tons per hour feed at 65 percent moisture and approximately 7.5 tons per hour at 80 percent. This would provide a total process capacity of about 18.5 to 30 tons per hour with a wet feed. At these rates drying of all material would be possible in 5 to 8 years, based on 7,500 hours per year.

Finally, the IHRD proposed would be smaller and operate at a lower shell temperature (1,100°F versus 1,600°F). Therefore, the IHRD would not require the present design concept's refractory within the furnace. This proposed smaller, cooler design should cost less than the current design, and as a result, the savings may be sufficient to offset the full cost of the pulse dryer.

VEALTDES.TAB

Table 6. Media Volumes and Moisture as Used by the VEST

Pit	In-Place Volume cu yd(1)	Dry Solids tons	Average Moist % DWB	Average Moist % As Recd	Cover Type	Liner Type	Pit Depth ft		Dry tons < 25% Moist	Dry tons > 25<60 Moist	Dry tons >60% Moist
1	68,400	102,600	25	20.0	Soil	Clay	29.5		102,600		
1-Soil	5,212	7,296	30	23.1					7,296		
2	37,400	37,400	50	33.3	Soil	Clay	23.5			37,400	
2-Soil	2,592	3,628	30	23.1					3,628		
3	276,750	221,400	65	39.4	Soil	Clay	42			221,400	
3	30,750	21,525	150	60.0							21,525
3-Soil	13,702	19,183	30	23.1					19,183		
4	72,800	109,200	25	20.0	RCRA-Cap	Clay	32		109,200		
4-Soil	4,736	6,630	30	23.1					6,630		
5-90%	88,110	40,971	200	66.7	Water	EPDM	29				40,971
5-10%	9,790	4,552	144	59.0						4,552	
5-Soil	9,581	13,413	30	23.1					13,413		
6-20%	1,920	2,054	100	50.0	Water	EPDM	20			2,054	
6-80%	7,680	8,218	45	31.0						8,218	
6-Soil	10,923	2,692	30	23.1					2,692		
Clearwell-90%	3,870	4,141	100	50.0	Water	Clay	12			4,141	
Clearwell-10%	430	460	45	31.0						460	
Clearwell-Soil	1,866	2,612	30	23.1					2,612		
BurnPit	30,300	42,420	30	23.1	Soil	None	26		42,420		
BurnPit-Soil	2,210	3,093	30	23.1					3,093		

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Total Dry Tons = 653,488

	Dry tons < 25% Moist	Dry tons > 25<60 Moist	Dry tons >60% Moist
Total Dry Tons	312,767	278,225	62,496
Assumed Avg. Moisture %	23	45	65
Wet tons to treat	406,719	505,864	178,560

(1) Volume includes any clay/soil from cap and/or liner

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VALUE ENGINEERING
ALTERNATIVE EVALUATION PROPOSAL NO. 2

PROJECT: Remedial Actions At Operable Unit 1	
COMPONENT: Dryer	**FUNCTION:** Dry Materials

ALTERNATIVE DESCRIPTION

- Improve drying system flexibility by using a combination of two different dryers, an IHRD to handle high solids content materials (with an added cooler/moisturizer system) and a pulse dryer to handle high moisture (slurry) materials.

BENEFITS	DISADVANTAGES
• Increases operational availability. • Reduces the uncertainty of operation by providing a better match of dryer capabilities to expected feed material characteristics. • Provides for greater flexibility in handling a wide range of moisture contained in excavated materials. • Should be able to obtain pulse system at little or no additional cost due to the reduction in capital cost for the IHRD drying components. • Makes the use of a slurry excavation approach practical for a larger percentage of the media without a significant reduction in drying capability. • Enables observational approach to excavation of the waste pits, thereby reducing the need for extensive characterization of the heterogeneous material in the pits. • Cooler/moisturizer system enables moisture content of final product to be better controlled.	• Possible increase in manpower requirements for two separate dryer systems. • Limited availability and track record of pulse drying systems. (However, of the three systems that have been built, all are operating successfully).

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VALUE ENGINEERING PROPOSAL NO. 2

PROJECT: Remedial Actions At Operable Unit 1	
COMPONENT: Dryer	**FUNCTION:** Dry Materials
ORIGINAL CONCEPT	**VE CONCEPT**
● Use a single indirect heated rotary dryer for all material drying.	● Add a pulse dryer to handle materials with high moisture content in addition to the IHRD. ● Reduce size and temperature required in IHRD unit. ● Add cooler moisturizer to end of IHRD system.

COST ITEMS	NONRECURRING*	LIFE CYCLE*
ORIGINAL CONCEPT	$	
VE CONCEPT (-)	$	
SAVINGS	$ undetermined	
NUMBER OF UNITS (X)	1	
TOTAL SAVINGS	$ undetermined	
VE STUDY COSTS (-)	$ 39,000	
IMPLEMENTATION COSTS(-)	$ undetermined	
NET SAVINGS	$ undetermined	

* CHOOSE ONE METHOD-USE NONRECURRING IF LIFE CYCLE COSTING DOES NOT APPLY.

VEALTMON.TAB

Due to time considerations and lack of estimating information during the time frame required, the team was unable to gather the needed data to make a reasonable estimate within the VE study period. However, the added cost to purchase the pulse dryer should be nearly or fully offset by the reduced cost of the IHRD needed as a result of implementing this proposal. Additional cost savings were anticipated by the VEST due to reduced energy requirements, reduced staff costs due to availability and flexibility issues, and increased ease of operations with varying material constituency.

IMPLEMENTATION OF PROPOSAL NO. 2

CRITICAL ITEMS TO CONSIDER:
This proposal was linked to Proposal No. 1 that improves material handling by optimizing the use of low solids approaches. The high efficiency drying capabilities (1,400 BTU/pound of water evaporated) of this proposal should be considered an essential co-requirement of electing Proposal No. 1.
The properties (moisture content, etc.,) of the heterogenous materials are very difficult to predict; and therefore, the flexibility of the selected drying system capabilities should be able to handle both low and high moisture levels within normal operations.
PROBLEMS AND HOW THEY CAN BE OVERCOME:
The pulse drying system proposed is only available from one identified vendor. Further searches should be conducted for additional possible domestic sources. Contracting procedures are available to handle this issue should additional suppliers not be found.
PROCEDURES: (WHO DOES WHAT)
SUMMATION OF BENEFITS AND DRAWBACKS OF THE VE PROPOSAL:
Benefits: Increased drying flexibility, enhanced drying capacity availability, matching of feed stream property to drying capabilities, reduced capital, cost of pulse dryer offset by cost reduction in IHRD required, and supports observational approach in excavation without excessive characterization.
Disadvantages: Possible increase in manpower and limited availability of pulse dryer.

VEIMPLEM.TAB

VE PROPOSAL DESCRIPTION

PROJECT: Remedial Actions at Operable Unit 1

PROPOSAL NO. 3. VACUUM ENHANCED COMPACTION USING EXTRUSION TECHNOLOGY

Background:
The design team previously recognized and recommended that some method to compact the material being shipped to Envirocare should be considered for inclusion in this project. At the time of this VE study, no specific equipment was specified and a study of the effectiveness of volume reduction on project costs did not appear to have been considered further.

Some innovative developmental work in volume reduction of soil for off-site shipment has been performed at the Mound Site (DOE/Ohio). A significant densification and related potential cost savings was demonstrated by use of a vacuum extrusion process. (This process has been used for more than 20 years in the brick and tile industry, and people knowledgeable in the methodology abound.) At the demonstration at the Mound Site, it was shown that operators were able to adapt the equipment to be used on various materials and compact unconsolidated soil from 80 pounds per cubic foot (lb/ft^3) to 140 lb/ft^3. During the demonstration, the soil source was compacted in the form of an 8 inch by 8-inch by 4-foot block for stacking in a white metal box. The achieved compaction of the soil from 80 to 140 lb/ft^3 represented a volume reduction of 57 percent.

Proposal:
The VEST proposal is to use densifying technology to achieve volume reduction in disposed materials. This would involve using the technology demonstrated in compacting the Mound Site soil to satisfy the recognized need for volume reduction at Fernald.

The soil and cover material in OU1 would be compacted and volume reduced using the vacuum extruder rather than drying the material. To ease handling at the Fernald and Utah sites, rather than producing the large extruded blocks demonstrated at Mound, it is proposed that the final waste form produced be small varied diameter extruded soil rods of varied lengths (2 to 3 inches). The rods would be randomized in length and railcar loading would be achieved using the same design and equipment currently planned for the project. The proposed OU1 soil materials to be densified are very similar to those used at the Mound Site. The fact that the process and equipment have been successfully demonstrated on the soil at the Mound Site makes a pilot study for the equivalent soil at Fernald unnecessary.

It is also proposed that the extruded soil should be selected or mixed such that it contain the optimum moisture for compaction that would meet the WAC at Envirocare without additional processing and its commensurate cost. Although a penalty is paid for shipping moisture that would otherwise be removed by drying, this penalty is more than offset by the cost savings realized by the reduced disposal costs due to volume reduction.

VE PROPOSAL DESCRIPTION

PROJECT: Remedial Actions at Operable Unit 1

Presently, the ability of the system to successfully consolidate/densify the actual pit contents has not been demonstrated. For this reason, and because of the significant potential savings involved, it is also recommended that the existing extruder at the Mound Site be modified to produce soil rods and that Fernald waste material from the pits be tested for densification potential at the Mound Site. (Each ton of material shipped at 100 lb/ft^3 and 30 percent moisture versus the design case of 80 lb/ft^3 and 10 percent moisture represents a $70/ton cost savings. If a density of 120 lb/ft^3 can be achieved, as demonstrated at the Mound Site, the cost savings would rise to $102/ton.

Note: Subsequent to the completion of the VEST Presentation Report, additional information of another successful densification demonstration has been received. The extruder manufacturer mixed 19 drums of flue-gas sludge (calcium sulfate/gypsum) with 40 drums of cement. Kiln dust plus 1 percent clay and extruded the mix. The contents of the 23 drums was reduced to 11 drums (53 percent volume reduction). These results are similar to those achieved with a commercial unit (20 tons/hr) at Bethlehem Steel in which the extruder processed blast furnace sludge and lime sludge into a recycled product.

VEALTDES.TAB

VALUE ENGINEERING
ALTERNATIVE EVALUATION PROPOSAL NO. 3

PROJECT: Remedial Actions at Operable Unit 1	
COMPONENT: Disposal	**FUNCTION:** Consolidate Waste

ALTERNATIVE DESCRIPTION

- Achieve waste consolidation through use of vacuum enhanced extrusion technology to produce volume reduction in the material being shipped for disposal.

BENEFITS	DISADVANTAGES
● Achieves volume reduction to produce savings in disposal costs. (Consolidation of soil only through densification will produce cost savings that can be expected to more than pay for the cost of the equipment and its operations.) ● Uses technology demonstrated and deemed acceptable to DOE in Mound, Ohio. ● Additional savings potential exists for every unit of waste determined to be acceptable after initial return on investment is recovered. ● Uses equipment that is expected to be robust and rugged enough to withstand severe service conditions. ● Compacted materials will greatly reduce potential for airborne radiation exposure during compaction at Envirocare and during loading at Fernald. ● High degree of knowledge and experience in the technology and process used to produce construction related blocks, bricks, and tiles, is available.	● Capital equipment cost will only be recovered when sufficient material is processed to obtain the payback. ● Will increase workforce requirements due to the additional equipment if added separately. ● Lack of experience in this technology's use in the hazardous waste disposal field will require some staff reorientation and may generate some apprehension.

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VALUE ENGINEERING PROPOSAL NO. 3

PROJECT: Remedial Actions at Operable Unit 1	
COMPONENT: Disposal	**FUNCTION:** Consolidate Waste
ORIGINAL CONCEPT	**VE CONCEPT**
• Dry all material to 10 percent moisture content with a design bulk density of 80 lb/ft^3. • Ship resulting dried material to Envirocare in Utah for disposal.	• Compact soil and liner material using densifying equipment to the highest bulk density allowed by the equipment (assumed maximum limit for cost issues by the VEST was 100 lb/ft^3, with a design moisture content of 25 to 30 percent).

COST ITEMS	NONRECURRING (100lb/ft^3)	NONRECURRING (120lb/ft^3)
ORIGINAL CONCEPT	\$ 34,900,000 @80 lb/ft^3 source	\$ 34,900,000 @80lb/ft^3 source
VE CONCEPT (-)	\$ 33,300,000 densified to 100lb/ft^3 (Including \$ 1,900,000 densifier capital cost)	\$ 30,100,000 densified to 120lb/ft^3 (Including \$ 1,900,000 densifier capital cost)
SAVINGS	\$ 1,600,000	\$ 4,800,000
NUMBER OF UNITS (X)	1	1
TOTAL SAVINGS	\$ 1,600,000	\$ 4,800,000
VE STUDY COSTS (-)	\$ 39,000	\$ 39,000
IMPLEMENTATION COSTS(-)	\$ 0	\$ 0
NET SAVINGS	**\$ 1,561,000**	**\$ 4,761,000**

VEALTMON.TAB

IMPLEMENTATION OF PROPOSAL NO. 3

CRITICAL ITEMS TO CONSIDER:
• The cost savings justification for the installation is dependent on the amount of material that can be successfully densified. The cost of installing, operating, and maintaining this equipment should be more than recovered by the densification of the soils alone. Although similar applications are occurring in industry with sludge materials, the degree to which the process can be used with the pit waste material has not yet been demonstrated.
PROBLEMS AND HOW THEY CAN BE OVERCOME:
• Lack of experience within the hazardous waste disposal field can be overcome through initial use of the technology on the site's soils to generate on-site experience. A performance type contract for the extruder or technology transfer procedure (training contract with real equipment) may be beneficial in this area too. Since expertise with densification methods is limited within the waste disposal field, as the FERMCO and Parson expertise is generated, sharing of the newly generated experience with other waste sites to enhance the overall waste disposal industries expertise should be performed.
• Uncertainty concerning the capabilities of the equipment/process for pit waste materials can be overcome by testing Fernald material on the Mound equipment.
• The increase in workforce requirements will be offset by the cost savings realized through the densification operations. Maximizing the densification use early in the process will minimize the time for the return on investment to be realized.
PROCEDURES: (WHO DOES WHAT)
• FERMCO and Parsons should visit the Mound Site and other locations to review the technology and develop their expertise in the densification technology.
• FERMCO crew should obtain training and demonstration experience in the use of the densification capabilities through consultation with DOE or others.
SUMMATION OF BENEFITS AND DRAWBACKS OF THE VE PROPOSAL:
<u>Benefits</u>: Demonstration and use of this volume reduction process can yield significant savings not only in OU1 but possibly in other areas at Fernald and Mound.
<u>Disadvantages</u>:The capabilities of the process are not fully known and very conservative estimates of savings must therefore be used.

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REMEDIAL ACTIONS AT OPERABLE UNIT 1
RECORD OF DECISION PLAN

DESIGN TEAM BRIEFING ATTENDANCE LIST
8:30 a.m., JUNE 26, 1995
FERMCO CONFERENCE ROOM

NAME	CODE/OFFICE	PHONE
Sam Martin, VE Study Team Leader	Bureau of Reclamation, Value Engineering, Reclamation Service Center, PO Box 25007, Denver, Colorado 80225	(303) 236-9120 Extension 234
Doug Maynor, VE Study Assistant Team Leader	Department of Energy, Ohio Field Office, PO Box 3020, 1 Mound Road, Miamisburg, Ohio 45343	(513) 865-3986
Rich Gibson, VE Study Team Member	Fernald Environmental Restoration Management Corporation (FERMCO), PO Box 538704, Cincinnati, Ohio 45253	(513) 648-6112
John Hall, VE Study Team Member	Department of Energy, PO Box 398705, Cincinnati, Ohio 45253-8705	(513) 648-3118
Thurle Moss, VE Study Team Member	FERMCO (Fluor Daniel), PO Box 538704, Cincinnati, Ohio 45253-8704	(513) 648-5860
Dale Pflug, VE Study Team Member	Argonne National Laboratory, 9700 South Cass Avenue, EAD/900, Argonne, Illinois 60439	(708) 252-6682
Carl Swanstrom, VE Study Team Member	Argonne National Laboratory, 9700 South Cass Avenue, EAD/900, Argonne, Illinois 60439	(708) 252-8890
Judith Becker	Jacobs Engineering Group at Fernald	(513) 865-3689
John Murphy	Department of Energy, Ohio Field Office, PO Box 3020, 1 Mound Road, Miamisburg, Ohio 45343	(513) 865-3689
Ken Stradford	Parsons, 6120 South Gilmore Road, Fairfield, Ohio 45014	(513) 870-8316
Carlton Scroeder	Parsons, 6120 South Gilmore Road, Fairfield, Ohio 45014	(513) 870-8433
Rochelle Chernioff	Parsons, 6120 South Gilmore Road, Fairfield, Ohio 45014	(513) 870-8282
Scott Mallette	Parsons, 6120 South Gilmore Road, Fairfield, Ohio 45014	(513) 870-8155

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CONSULTATION RECORD

CONSULTANT (Name,Title, Company/Address)	CONTACT INFO (Telephone, Location)	MAIN TOPIC DISCUSSED AND INFORMATION RECEIVED
Leon Collins - EG and G, Rocky Flats	(303) 966-6968	Rocky Flats experience.
Rich Staark, J. C. Staark and Sons	(704) 878-0789	Vacuum compacting.
Paul DePercin, U.S. Environmental Protection Agency	(513) 569-7797	EPA site experience.
Ralph Dantino, Martin Marietta, Portsmouth	(614) 897-4012	Portsmouth experience.

CONSULT.REC

INFORMATION/DATA DOCUMENTS CONSULTED

DOCUMENT (Name, Author, Dates, etc.)	INFORMATION RECEIVED/USED
Draft Remedial Design Work Plan for Remedial Actions at Operable Unit 1 *(Draft)*, FEMP, DOE, May 1995.	Proposed work plan activities and approach.
OU1 Project Conference Notes Minutes, Avail-Thurle Moss (FERMCO), dates: 1/11/95, 1/18/95, 1/26/95, 2/1/95, 2/2/95, 2/9/95, 2/16/95, 2/23/95, and 2/23/95.	Design and concept discussions history and background relating to the implementation of the ROD plan.
Final Record of Decision for Remedial Actions at Operable Unit 1, FEMP, DOE, January 1995.	This was the basic criteria and plan document which governs the project during the VE study period. Consulted for the ROD plan, other major options considered, background for ROD, criteria, public concerns, and site information.

INFORMATION/DATA DOCUMENTS CONSULTED

DOCUMENT (Name, Author, Dates, etc.)	INFORMATION RECEIVED/USED
OU1 ADS Waste Pit Remediation 1995 Baseline Planning (dated October 26, 1994), Remedial Design, Avail-DOE, 1994.	Scheduling and planned operational activities for the OU1 project for various options as listed in the ROD document.
Operable Unit 1 Cost Estimate (Draft dated 7/1/94), FEMP, DOE, July 1994.	Cost basis information and operational work plans background information.
Remedial Investigation/ Feasibility Study Progress Report, FEMP, DOE, October 1992.	Background information and overall site situation discussions.
OU1 Design Progression, Wordperfect 5.1 file DESBASIS.H printout dated October 26, 1994.	Technical information for basis leading up to the Preferred Remedial Alternative (PRA).
Environmental Restoration and Waste Management Five-Year Plan for FY94-FY98, Volume III Public Concerns, DOE, August 1993.	Background information for remediation process in DOE sites and master plan information.
Environmental Restoration Schedule Report Operable Unit 1, FEMP, DOE, July 8, 1992.	Background information and schedule framework for previous concepts.
Annual Environmental Report for Calendar Year 1990 for Feed Materials Production Center, Westinghouse Materials Company of Ohio, December 1991.	Background information for the overall site, historical operations, and environmental concerns.
FEMP Roadmap FY92, Westinghouse Environmental Management Company of Ohio, September 1991.	Background information, schedule environment, and operational flow plans for previous concepts.
Environmental Restoration and Waste Management FY93-FY97, DOE, August 1991.	Background information for remediation process in DOE sites and master plan information.

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